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THE CANADIAN GEOGRAPHICAL SOCIETY

OTTAWA, CANADA

The Society's ambition is to make itself a real force in advancing geographical knowledge, and in disseminating information on the geography, resources and people of Canada. In short, its aim is to make Canada better known to Canadians and to the rest of the world.

As one of its major activities in carrying out its purpose, the Society publishes a monthly magazine, the Canadian Geographical Journal, which is devoted to every phase of geography—historical, physical and economic—of Canada, of the British Commonwealth and of the other parts of the world in which Canada has special interest. It is the intention to publish articles in this magazine that will be popular in character, easily read, well illustrated and educational to the young, as well as informative to the adult.

The Canadian Geographical Journal will be sent to each member of the Society in good standing. Membership in the Society is open to any one interested in geographical matters. The annual fee for membership is four dollars (Canadian currency).

The Society has no political or other sectional associations, and is responsible only to its members. All money received is used in producing the Canadian Geographical Journal and in carrying on such other activities for the advancement of geographical knowledge as funds of the Society may permit.

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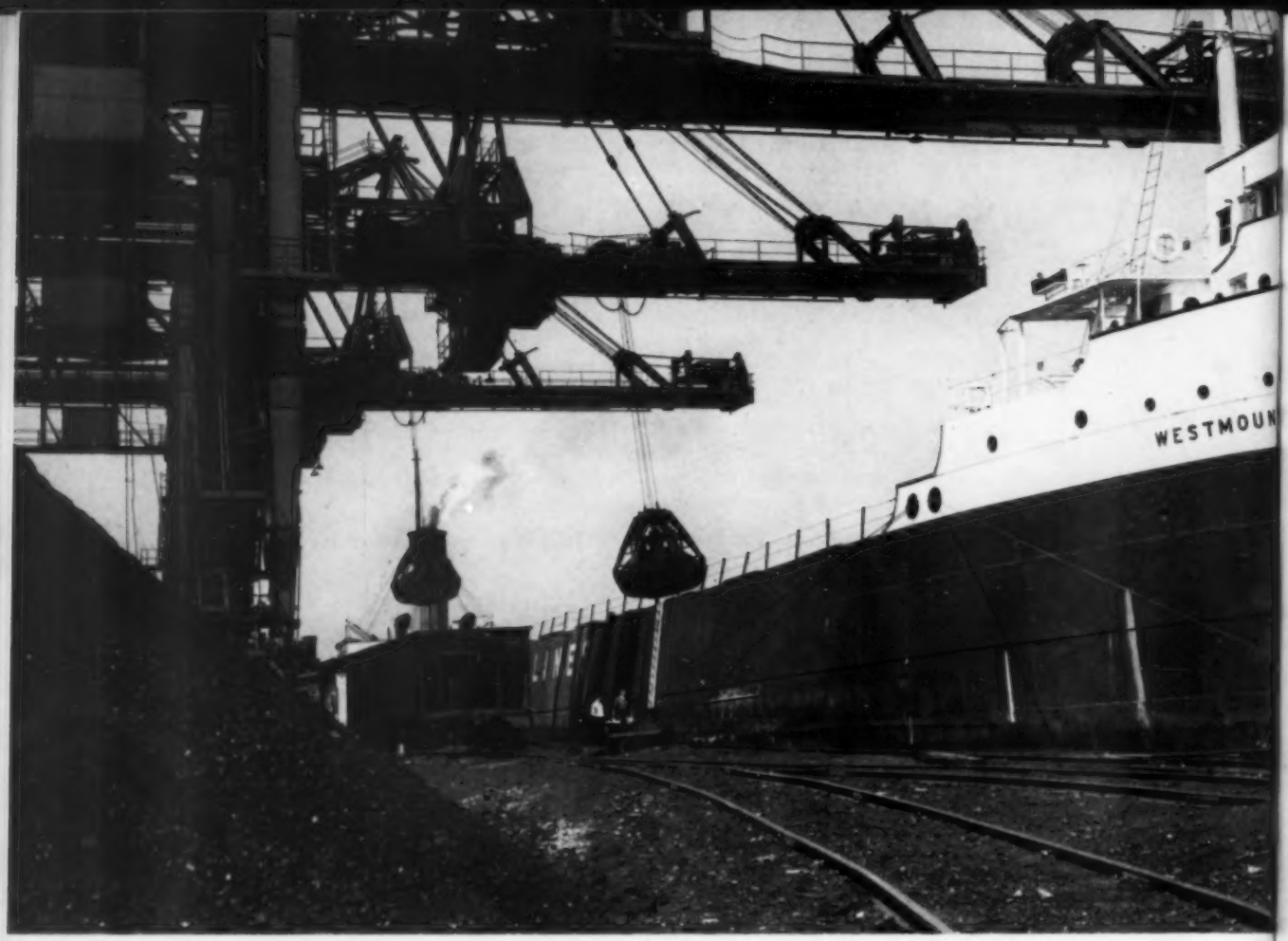


Steel Forges Ahead

by B. J. McGUIRE

AN INTERNATIONAL SITUATION requiring utmost vigilance by freedom-loving Canadians, coupled with an internal, peacetime expansion unsurpassed on this continent since the Americans surged west of the Mississippi in the last century, resulted in 1951 in demands by Canadians for more basic steel than ever before in history. The Canadian industry responded to this appeal with a record-breaking ingot production of 3,445,883 net tons. Equally encouraging in the light of the uncertainties of the future is a bustling program of expansion which foreshadows further substantial increases in steel supplies in the immediate future.

Measured against the producing capacity of the world's great nations, Canada's 1951 production—up more than 150,000 tons from the previous year—may not appear unduly impressive. But any assessment of Canada's achievements in the production of steel must recognize two basic, historical facts. One is that when the world entered the Age of Steel, Canada's limited industrial development made it inevitable that she should get a slow start in this industry. Equally important is the fact that she possesses an internal market of 14,000,000 people while that of the United States numbers more than 156,000,000. Against this background, Canadian steel production, which will approximate some 600 pounds per person in 1953,

At top:—Steelmaking starts with iron ore. Here three unloading bridges, each 674 feet long, move ore from a big lake ship. Each grade of ore is piled separately. Ore may come in lumps or as a loose powdery earth and may vary from the common brick red to a metallic black. Stelco alone uses 1,900,000 tons of ore a year.

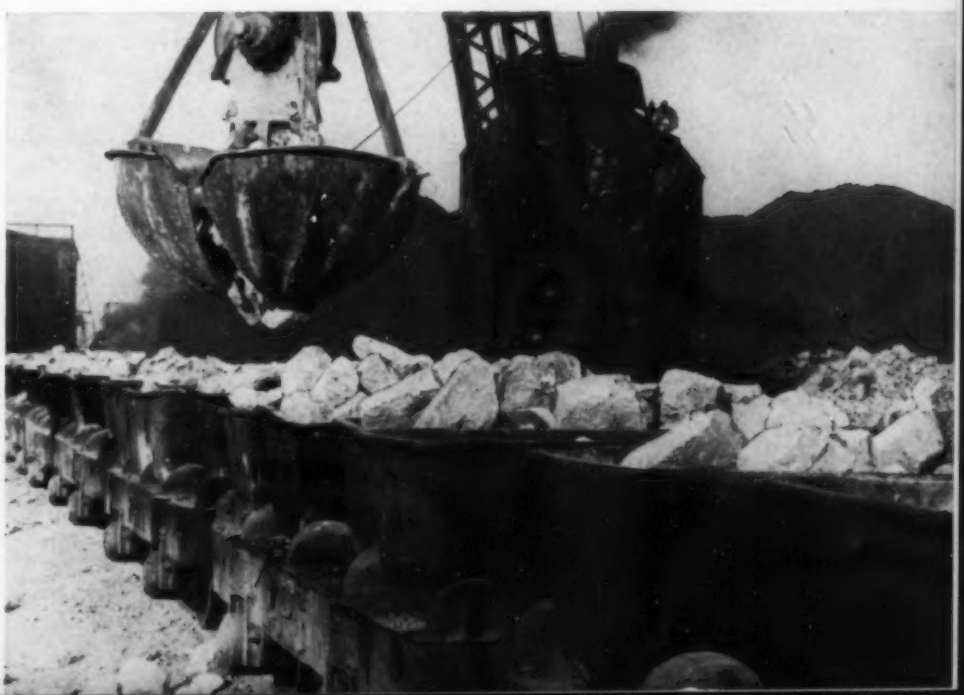
may be viewed as a notable achievement. The concerted expansion of the steel industry in the period 1951-52 has placed Canada fifth as a steel producer on a per capita of population basis.

This upward surge in steelmaking capacity has not been limited to the last few years. Indicative of the vigour of the nation and the vitality of the steel industry is the further fact that Canada more than doubled her steelmaking capacity in the period between 1939 and 1951.

Just as proper and sufficient food is the source of strength for individual Canadians, so steel can be said to be the source of strength to the national economy. This essential role is based in part on the fact that steel itself is used in the manufacture of practically every consumer product; steel being required in large quantities in the manufacture of machinery and equipment which in turn are used in making a vast variety of things which actually contain none of this metal. Such essentials as food, clothing, chemicals, and even other metals, could never exist as we know them without the steel implements, tools and machines used in their production and transportation.

If Canada is to continue her present rate of growth, she will need increasingly large amounts of implements, tools, equipment and machines, all of which require increasingly large amounts of steel. In the past half century, this country has grown from a producer of raw materials to a manufacturing nation ranking third among world traders. Stimulated by national alertness and the opportunities which are the heritage of this vigorous young country, this growth and development is proceeding at an accelerated pace. The great iron ore developments in Labrador and at Steep Rock, and the vast aluminum development at Kitimat on the Pacific Coast are spectacular indications of a growing Canada. In the 3,000 miles between these two projects, thousands of other industrial enterprises are coming into being or expanding. This means growth, and this growth and every development that contributes to it—plants, ships, armaments, pipelines, railway lines, power developments, highways, oil wells, mines, bridges, machinery—develop their own tremendous appetites for steel. To satisfy these growing appetites, the Canadian steel industry is now spending no less than $130,000,000 in plant expansion.

What is this thing called steel, which exercises such an influence on modern life? The most simple answer is that steel is a product of iron, and iron was known and used more than 6,000 years ago. When it is first made, iron usually contains small quantities of elements such as manganese,



An important ingredient in steelmaking is limestone — although none of it is ever left in the steel. The limestone is used as a flux to combine with and carry off impurities in both the blast furnaces and open hearth furnaces. More than 400,000 tons of limestone a year are used in Stelco's operations. Most of it comes from quarries at Beachville, Ontario.

Coal is very important in the production of steel. Baked in long narrow ovens it produces coke which is almost pure carbon. Coke is used in the blast furnaces to generate the high temperatures necessary to smelt iron from the ore. This picture shows the newest battery of coke ovens in Canada, 83 ovens which went into production at Hamilton in June 1952. In all, there will be 194 coke ovens at Stelco's Hamilton Works by the spring of 1953.

silicon, phosphorus, sulphur and carbon, with a molecular arrangement or crystallization which makes it brittle and limits its behaviour and hence its usefulness. Ordinary steel—or carbon steel as it is called—contains about 99 per cent iron and 1 per cent by weight or less of carbon. Carbon steel represents more than 90 per cent of all steel produced in Canada. The remaining 10 per cent is made by the addition of precise quantities of alloying metals such as manganese, nickel, silicon, tungsten, copper, chromium, molybdenum, cobalt and vanadium. The quantities of these metals, or any combination of them, which are added to the "heat" of steel, will determine its character, in somewhat the same manner that different ingredients change the appearance and flavour of a cake. The change in the metal, however, is not only in its appearance, but in its strength and its ability to withstand vibration, extreme temperature changes, strain or corrosion.

The development of facilities for changing large quantities of iron into steel has not only increased the uses of steel, but has also exercised a profound influence on the world and its history. The greater strength alone suggests its increased usefulness in a mechanized and industrial world; a square inch test bar of iron will lift a load ranging from 28,000 to 40,000 pounds without breaking, while a test bar of the same size made of certain steel alloys will take a load of 500,000 pounds.

A fully integrated steel industry which makes iron, steel and a normal range of steel products is perhaps the best illustration of the fact that a business which requires big tools must itself be big. Bigness is a characteristic of the industry. The blast furnaces that make the iron are big, as are the air-heating stoves towering skywards beside them. The furnaces that convert iron into steel are huge structures. The ingots that go to the rolling mills can be massive things. The rolling mills themselves, as well as the buckets, ladles, cranes, tanks and locomotives that are used in the industry—all are big. Not only are they large in size, but they

One of the most spectacular sights at a steel mill is pushing the flaming coke from an oven. The baking process produces 13 tons of carefully blended coke from 17.5 tons of coal, the balance being driven off in gases and volatile materials.

cost very large amounts of money both to buy and to maintain. As a consequence, large organizations with large amounts of capital, representing savings from many sources, are needed to operate such an industry.

The mother of the steel industry is the blast furnace which produces the pig iron later converted into steel. Blast furnaces, as essential to the steel industry as the milch cow to the dairy industry, are as impressive and spectacular as they are important. Huge metal structures, they may tower higher than a ten-storey building, with steel and brick-lined walls three feet thick, an inside diameter up to 28 feet, and a production capacity which may exceed 1,400 tons a day. The cost of a blast furnace is as impressive as its size, ranging in Canada from $8,000,000 to $15,000,000.

There are sixteen of these metal monsters in the Dominion. Four are located in the plant of the Dominion Steel and Coal Corporation in Sydney, Nova Scotia; four, including two of the largest in Canada, in the plant of The Steel Company of Canada, Limited, at Hamilton, Ontario; two of smaller size at the Canada Furnace Company, Limited, in Port Colborne, Ontario; five at the Algoma Steel Corporation plant at Sault Ste. Marie, Ontario; and one at Dominion Foundries and Steel Limited in Hamilton. Together they give Canada a production capacity of approximately 4,050,000 tons of pig iron annually.

Three basic raw materials are used in the production of iron—iron ore, limestone and coke. There is, however, a fourth ingredient which is of equal importance. That is hot air. The amounts of raw materials used in the

A blast furnace is a circular brick-lined steel structure which may be considerably more than 100 feet high. The furnace's structure is at the left in this picture while at the right are three "stoves" which heat air blown into the base of the furnace, at a pressure of 18 pounds per square inch. This air is what is known as the blast and it takes nearly four tons of air to produce the combustion necessary to smelt one ton of iron from the ore.

Coke is the fuel used in a blast furnace. Originally, charcoal was used for this purpose, but about 200 years ago the English began to use coke which is made by driving the liquids and gases from coal. Valuable chemicals are driven off when the coal is heated. About forty years ago the value of these chemicals was recognized and modern by-product coking ovens came into existence. These are gas-heated chambers, 35 to 40 feet long, less than 2 feet wide and about 10 feet high, where the coal is cooked for fifteen to twenty hours at approximately 1,800 degrees Fahrenheit. It is then pushed from the chamber, moved to a quenching tower and sprayed with water. In addition

production of 2,000 pounds of pig iron will vary with the quality of the materials, but normal conditions require about 4,000 pounds of iron ore, over 1,800 pounds of coke, and some 1,000 pounds of limestone. In addition to this the astonishing amount of 6,000 to 7,000 pounds of air heated to a temperature of more than 1,000 degrees is also required in the production of that 2,000 pounds of iron. This large consumption of super-heated air is what gives significance to the word "blast" in blast furnaces, since it is blown into the furnace as a continuous blast.

This view of one side of a blast furnace shows the "skip hoist". The two cars are the skips and into them are loaded iron ore, coke and limestone, which are charged into the furnace at the top and form alternate layers. As the coke burns and smelts the iron from the ore, the whole charge gradually descends towards the base of the furnace where the temperature is about 3,000 degrees Fahrenheit. The molten iron flows to the bottom of the furnace. The limestone combines with the remaining substances and forms the molten slag which rests on top of the iron.

White-hot iron flows from the base of the hearth in the blast furnace to the ladle car at the bottom right. The four blast furnaces at Stelco's Hamilton Works produce 3,300 tons of iron a day, the largest output in Canada.

to the coke, more than fifteen important by-products are obtained by capturing the gases and vapours released in the distilling process. Nylon, as an outstanding example, is based on benzol obtained this way, as are sulpha drugs, aspirin, synthetic rubber. Literally hundreds of valuable products are now made from these gases and vapours which less than half a century ago were allowed to pollute the air.

Coke, limestone and iron ore are "charged" into the top of the blast furnace. The action in the furnace, where the temperature ranges from 400°F. at the top to 3,000°F. at the bottom, produces pig iron—a term stemming from the ancient practice of pouring molten iron into sand moulds to cool and solidify in a line of blocks bearing a striking resemblance to a litter of little pigs at lunch. Although a small percentage of this pig iron is sold each year to foundries that make cast-iron products, the greater part is converted into steel.

From the open-hearth furnace, invented in France in 1864 by the Martin brothers, now comes more than 85 per cent of the world's steel, but this process must give way in historical precedence to the Bessemer Converter, patented in England in 1854 by Henry Bessemer. The contribution of these men to the Age of Steel—which in effect they launched—was a technique for "burning" the undesirable elements out of iron with speed and efficiency which made large-volume production possible.

The electric furnace is also used to produce steel. In this the heat is produced by an electric arc. Since it can be more precisely regulated than either an open-hearth or a Bessemer, it is used to produce the finest grades such as stainless steel, heat resistant and tool steels, where strict accuracy is

necessary in controlling the temperature and contents to produce the highly specialized steel alloys required for special uses. Electric furnaces have a capacity ranging from 5 to 90 tons each, and produce about 5 per cent of the country's total.

The willing work-horse of the Canadian industry is the open-hearth which produces about 95 per cent of Canadian-made steel. With capacities ranging from 50 to 275 tons, these furnaces resemble huge steel stoves with dish-shaped depressions, 25 to 35 inches deep, in the section which would correspond to the stove's oven. The materials to be processed—called the "heat" by the steel men—are placed in these depressions by mechanical charging machines. Limestone is placed on the bottom of the hearth to absorb impurities that are present in the iron and are released by the heat. While the content of the "heat" may vary depending on conditions, a normal charge would be 50 per cent of molten pig iron and 50 per cent of steel scrap and other materials.

Various fuels are used, such as natural gas, fuel oil, tar or coke oven gas. Heated air is added to the fuel to make it burn more fiercely so that great tongues of flame lash the surface of the materials in the furnace, driving the temperature above 3,000°F. and causing the heat to become a white-hot, seething mass of molten metal. This "cooking" process continues from 8 to 13 hours under constant observation and temperature control, when the metal is tapped off into ladles. At this stage, with the impurities burnt off or absorbed in the limestone, it receives the correct amount of alloying material so that the steel may meet the specified requirements.

Steelmaking in the past decade has become much more complex. Today virtually all steel is made according to very rigid specifications. Consequently it is now necessary to start building characteristics into steel as early as the blast furnace stage. In other words, a blast furnace no longer produces just "pig iron", but pig iron made from a variety of iron ores in accordance with the characteristics demanded by cus-

Scrap is an important raw material at a steel mill. Old ships, locomotives, automobiles, machinery, farm implements and many other iron and steel products come back to the scrap yard where they are cut into chunks easy to handle, and melted down again to make new steel.

Largest electric furnace in Canada is this one at Stelco's Hamilton Works, which has a capacity of 85 tons. Note the three big red-hot electrodes which have been lifted out of the furnace. Electric furnaces provide closer control over the quality of steel than do any other type and therefore are generally used to make special grades of steel. Electric furnaces use only scrap.

tomers' steel specifications. Thus a blast furnace charge may contain iron ore from several different sources such as Steep Rock, Mesabi, Michipicoten, and even Brazil.

When the steelmaking process is completed, the metal is poured ("teemed" the steelworkers say) from the ladles into large, oblong-shaped moulds where it cools and solidifies into what is called an ingot. The next stop on its route to market is the soaking pit, a sunken chamber where the metal is literally soaked to a uniform temperature in heat supplied by gas or oil. Like most hot things, steel solidifies first on the outside, so the outside may be solid while the interior is still molten. The soaking pits bring the solidified ingot to a uniform temperature throughout its mass so that it can be rolled.

About 15 per cent of the steel from the open-hearth is diverted to other processes such as casting, but the remainder emerges from the soaking pit and moves to rolling mills where, by the pressure of huge rolls, the ingots are changed into what are called "slabs" and "blooms". Depending on their destination, "blooms" may later be formed into billets by similar type rolls. The reduction and shaping process continues by the pressure of specially designed and various shaped rolls, interspersed, where necessary, by heating processes which bring the steel to the required temperature and temper.

"Blooms" proceed to the rail and structural mills (known as finishing mills) and there are fed through a series of rolls until formed into rails and structural shapes which may be used for buildings, railways, ships, machinery, electrical towers or any one of countless uses of this kind.

Slabs move from the semi-finishing mill

Tons of white-hot molten pig iron are charged into an open-hearth furnace. Before the iron is added to the "heat" an approximately equal weight of scrap iron and steel has been melted while a quantity of limestone also has been added to carry off the impurities.

One of the major recent developments, ensuring better steel for customers, was inauguration of the immersion thermocouple method of measuring the temperature of liquid steel in Stelco's open-hearth. The temperature is recorded accurately by an electronic recorder. This method gives greater control over temperature in the furnace, as well as in obtaining the correct tapping temperature for each grade of steel.

to plate, sheet, strip or tin-plate mills, there to be reduced in size and thickness to be used as plates for the hulls of ships, sheets for automobile bodies, stoves, licence plates, tin cans, roofing, tanks, pails, drums and all the other items which can be made from sheets of steel.

Billets may go either to the bar and rod mills or to the tube mills. In the first instance they are further reduced in girth, with a corresponding increase in length, until they have the correct dimensions for their commercial purpose, whether as pins, paper clips, nuts, bolts, wire, tools or machinery parts.

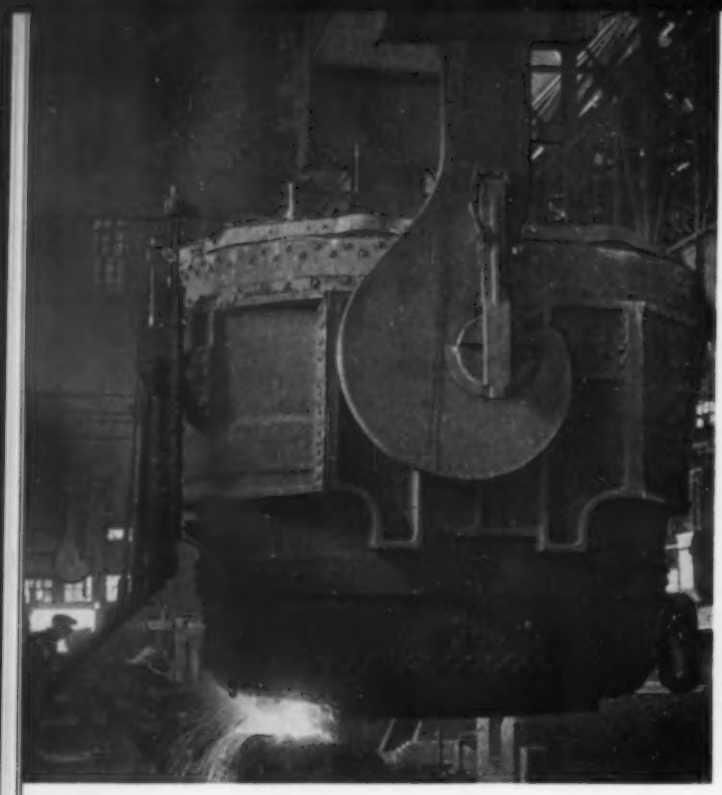
The very size of the industry tends to preclude new and startling developments which would revolutionize basic processes overnight, but the steady contribution of research to the improved efficiency and greater usefulness of the industry has been impressive. The Mackie retarded cooling process, developed in the Sydney plant of Dominion Steel and Coal Corporation, has international importance in the fabrication of steel rails. Dosco's recent experiments in long-distance shipping of hot steel ingots is currently attracting the attention of the world-wide industry. One of the outstanding developments of the last quarter century, pioneered in Canada by The Steel Company of Canada, Limited, was the mixture of blast furnace gas with coke oven gas to form a satisfactory metallurgical fuel. Prior to 1926 blast furnace gas was a waste product resulting in much atmospheric pollution. In that year gas-washing equipment, and an elaborate system of large overhead pipelines, were installed in order to make blast furnace gas available as a fuel in open-hearth and slab heating furnaces, soaking pits, and coke ovens. The use of such formerly waste gas is now standard practice in all North American steel mills.

Another successful innovation at The Steel Company of Canada, Limited, was the commercial use of oxygen in open-hearth furnaces. Since the purpose of the open-hearth is to burn the impurities out of the iron, and since oxygen is a gas which reacts readily with the impurities in the iron and releases a fierce heat, experiments were undertaken with oxygen in the open-hearth operation. The experiments proved a success, reducing the time required for each heat in the open-hearth, thus speeding up production and cutting costs. This Canadian development has now come into world-wide use and is helping to increase the quantity and lower the cost of steel everywhere.

Such developments have widened the scope for steel and have made it possible to bring iron ore from the mine and through many processes to the market as steel at a selling price of less than 5 cents a pound. It is no exaggeration to say that this is "cheaper than dirt" because the earth used for growing certain flowers often costs more than 5 cents a pound.

Largest steelmaking organization in Canada, playing a distinguished role in the industry at home and abroad, is The Steel Company of Canada, Limited. The nerve

After the heat of steel has been cooked for about six hours in an open-hearth furnace, samples are taken and tested quickly in the chemical laboratory. When the carbon content is exactly according to specifications the furnace is tapped and the steel is run out into a big ladle. Slag, which is lighter, floats on the top and eventually runs off into a slag pot.



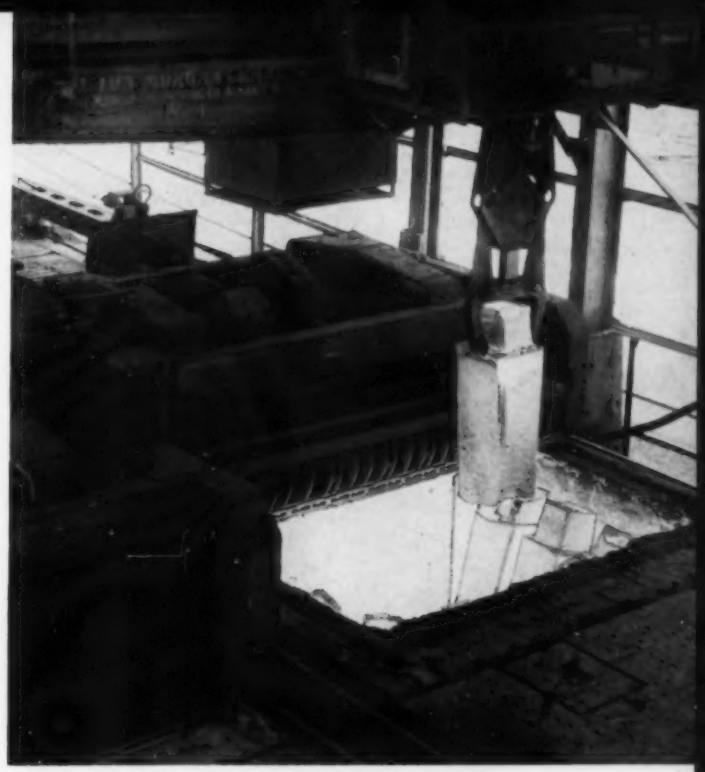
centre of this organization is in Hamilton, Ontario, where its blast furnaces and open-hearth furnaces are located. Hamilton is the centre of the recent giant expansion program which has increased Canada's steelmaking capacity by some 20 per cent. The total steelmaking capacity of this company is 1,900,000 tons. This represents all the steel required for 5 lake ships, 350 diesel locomotives, 5,000 railway freight cars, 10,000 large machine tools, 10,000 grain combine machines, 20,000 farm tractors, 50,000 trucks, 85,000 housing units, 100,000 household refrigerators, 100,000 washing machines, 140,000 automobiles and 1,000 army tanks.

Few, if any, countries in the world can surpass the great variety of the hundreds of products that Stelco produces in its nine works. The installation of the electrolytic tinning line in 1948 completed a program which made Canada almost self-sufficient in regard to this material, saving Canadians hundreds of thousands of dollars used formerly to buy tin plate from abroad. About 13,000 employees come to work every day in these plants — 9,000 in the three Hamilton works alone. In 1951 they received $42,053,894 in wages and salaries. To make these jobs possible, the company had invested more than $131,000,000 in its works, an average of $10,000 to create each job.

This company has grown faster than any other steelmaking establishment in Canada. In 1952, it responded to the nation's need for more and more steel with the installation of a 1,400-ton blast furnace, one of the world's largest. To feed this furnace, 83 new coke ovens were installed and a vast new dock and ore bridge for handling raw materials were built on reclaimed land in Hamilton Bay. To utilize the iron from the furnace, four new open-hearth furnaces of the latest design and 275 tons capacity were built; a new slab furnace and additional rod mill capacity were among the other 1952 additions to the Hamilton plant's facilities. All this was accomplished in record time and at a cost in the vicinity of $65,000,000. This project, as all previous Stelco projects, was privately financed entirely in Canada. These additions expanded the company's output by 50 per cent. Together with the additions made earlier (including a blast furnace in

Extreme left:—The ladle full of molten steel is lifted by a huge crane and poised over a long succession of ingot moulds. By the use of stopper rods the molten steel is allowed to flow from pouring nozzles in the bottom of the ladle, filling two moulds at a time, then the crane moves the ladle into position for the next moulds. This operation is called "teeming" or pouring.

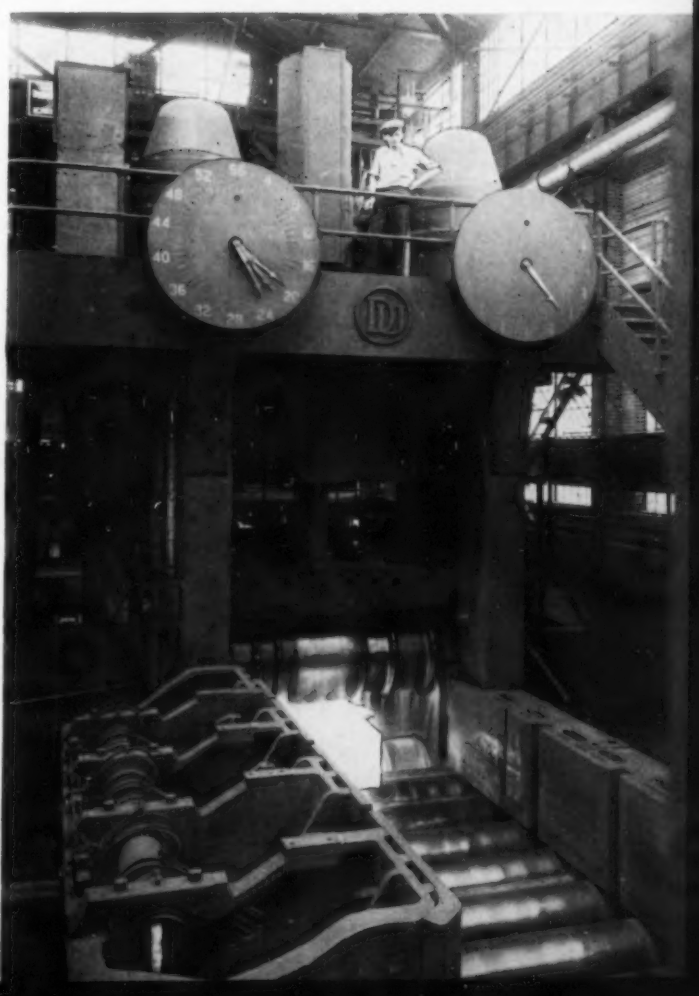
Left:—After the steel has solidified, the mould is removed by a stripper crane which has a plunger holding the steel down while the mould is lifted off. The steel now is called an ingot. Ingots vary in size from four and a half to fifteen tons, depending on the use to which the steel is to be put and the rolling operations involved.



1941 which was then the largest in the British Commonwealth) this expansion program gives the company an ingot capacity of more than four times its annual capacity between 1935 and 1939.

The city of Hamilton became associated with steel in 1854, when a company there helped to launch a plant at Houghton, Norfolk County, for the manufacture of locomotive wheels. This venture followed the path of many pioneers to financial failure, but in 1895 the Hamilton Blast Furnace Company was formed to produce pig iron for foundry use. Later it combined with the Ontario Rolling Mills under the title of the Hamilton Steel and Iron Company. This company is today the main unit of The Steel Company of Canada, Limited—the most completely equipped company in the Dominion in terms of smelting and fabrication facilities.

Ingots then go to the soaking pits, which are gas fired furnaces. These re-heat the ingots to a uniform temperature throughout, so that they are ready for rolling.



The first operation performed on the heated ingot is squeezing it between two rolls in a reversing type bloom mill. If the steel is to go into sheets or other flat products, the ingot becomes a slab which is wider than it is thick. If it is to go into bars, wire or similar products, it is rolled into a bloom which is roughly square. This picture shows a 44-inch bloom mill.

Next operation for a bloom is to put it through a billet mill, which at Stelco's works consists of a series of eight roll stands which take the steel through a series of continuous reductions, making the billet constantly smaller and longer. Following the last stand of rolls, flying shears cut the billets to the required lengths while the steel is still in motion.

Every billet is carefully inspected and imperfections are chipped out by compressed air chisels, as shown below left. Billets are rolled into a tremendous number of shapes and sizes in bar mills. The steel passes from one roll stand to the next guided by skilled men (below right). The steel may come out round, half round, oval, half oval, square or in many angles and special shapes. These bars are used in the construction of machinery, railway equipment, automobiles, farm implements, household equipment and many other products.

The Steel Company of Canada, Limited, now has a total of nine plants, located at Brantford, Gananoque, Hamilton, Montreal and Toronto. The main plant is Hamilton Works, where steel for the other eight finishing plants is produced. Hamilton Works has a battery of 194 coke ovens; four blast furnaces with a combined annual capacity of 1,225,000 tons of pig iron; and thirteen open-hearth furnaces and one electric furnace with a combined annual capacity of 1,900,000 ingot tons of steel.

At Hamilton Works there are also a bloom and billet mill; bar and rod mills; sheet mills; and a plate mill. Included in this plant is the only continuous hot strip mill in Canada, and also a continuous cold reduction mill and electrolytic tinning line. Hamilton Works has an annual capacity of 675,000 tons of blooms, billets, bars, rods and track materials, and 790,000 tons of plates and sheets, including tin-plate and galvanized sheets.

At Hamilton, Stelco also operates two finishing plants—Canada Works and Ontario Works. Canada Works makes wire and wire products, including fences, nails, tacks, and screws. Ontario Works is a rolling mill with an annual capacity of 93,000 tons. The principal product of the latter mill is railway accessories such as tie-plates, splice bars and spikes.

At Swansea, on the western outskirts of Toronto, a Stelco plant turns out 43,500 tons of bolts, nuts, and rivets each year, and at Brantford another Stelco plant turns out more than 10,000 tons of nuts and bolts principally for the automotive trade.

There is a Stelco forging plant at Gananoque capable of producing 15,000 tons of miscellaneous forgings every twelve months, and three finishing plants in the Montreal area.

Largest of the Montreal plants is Notre Dame Works which makes a wide variety of rolled and wire products. This plant has an annual capacity of 50,000 tons of plain wire, 1,080 tons of galvanized and tin wire, 26,500 tons of nails, together with an additional 26,600 tons of related products such as horse-shoes, horse-shoe nails, nuts and bolts. The only lead shot tower in Canada is also located at Notre Dame Works, and putty and white lead are produced there in quantity.

At Dominion Works near Lachine there is a Stelco plant with an annual productive capacity of 46,200 tons of plain wire, 18,000 tons of galvanized wire, and 27,500 tons of other wire products including fence. A

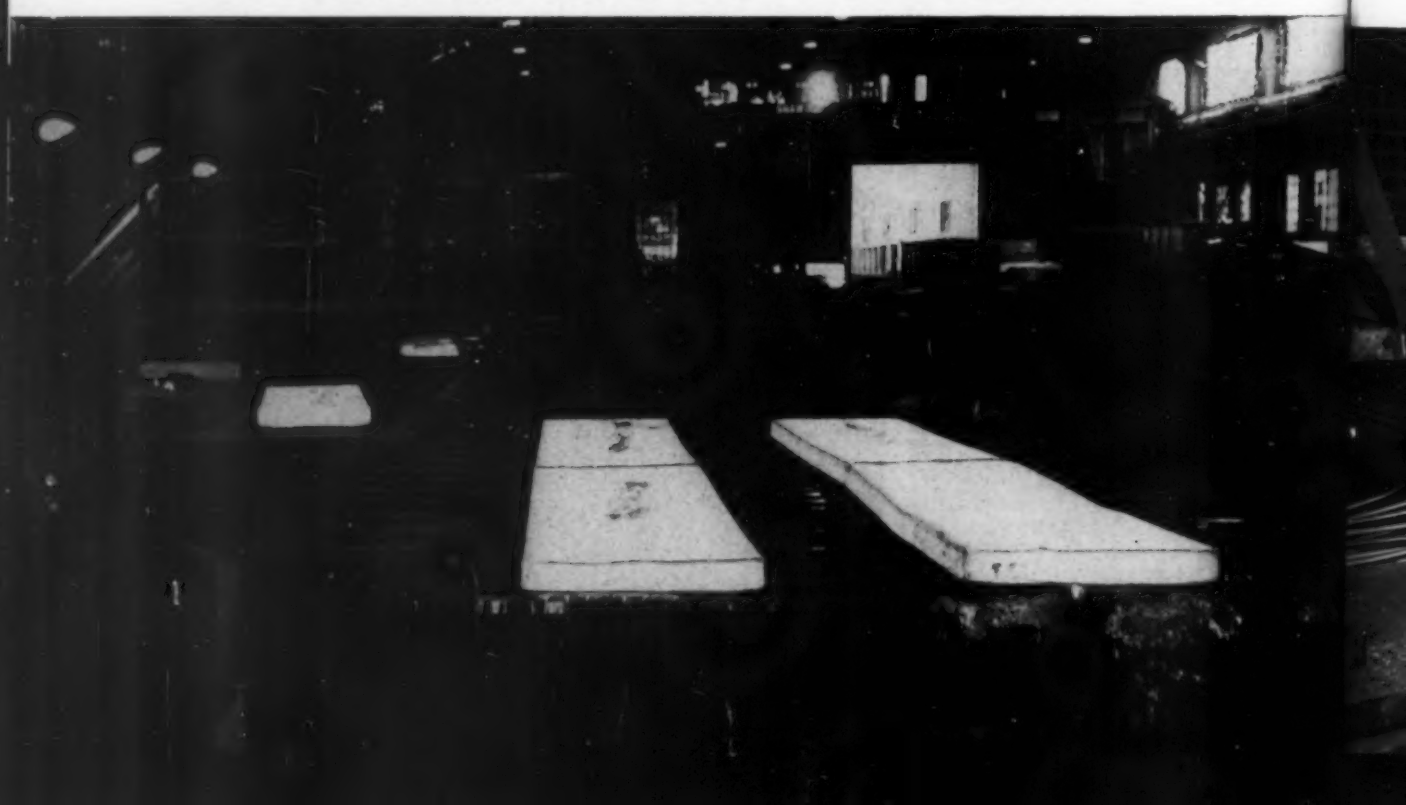
Angles which have been rolled in the bar mill are shown on the cooling bed. They will be cut to the proper length for shipment.

Nothing is left to chance in making sure that steel is exactly right to meet the needs of customers who buy it. In this picture a laboratory technician is milling a sample of steel so that chemical tests can be made.

Stelco pipe mill capable of a yearly production of 39,000 tons of pipe up to 4 inches in diameter is located in the St. Henry district of Montreal.

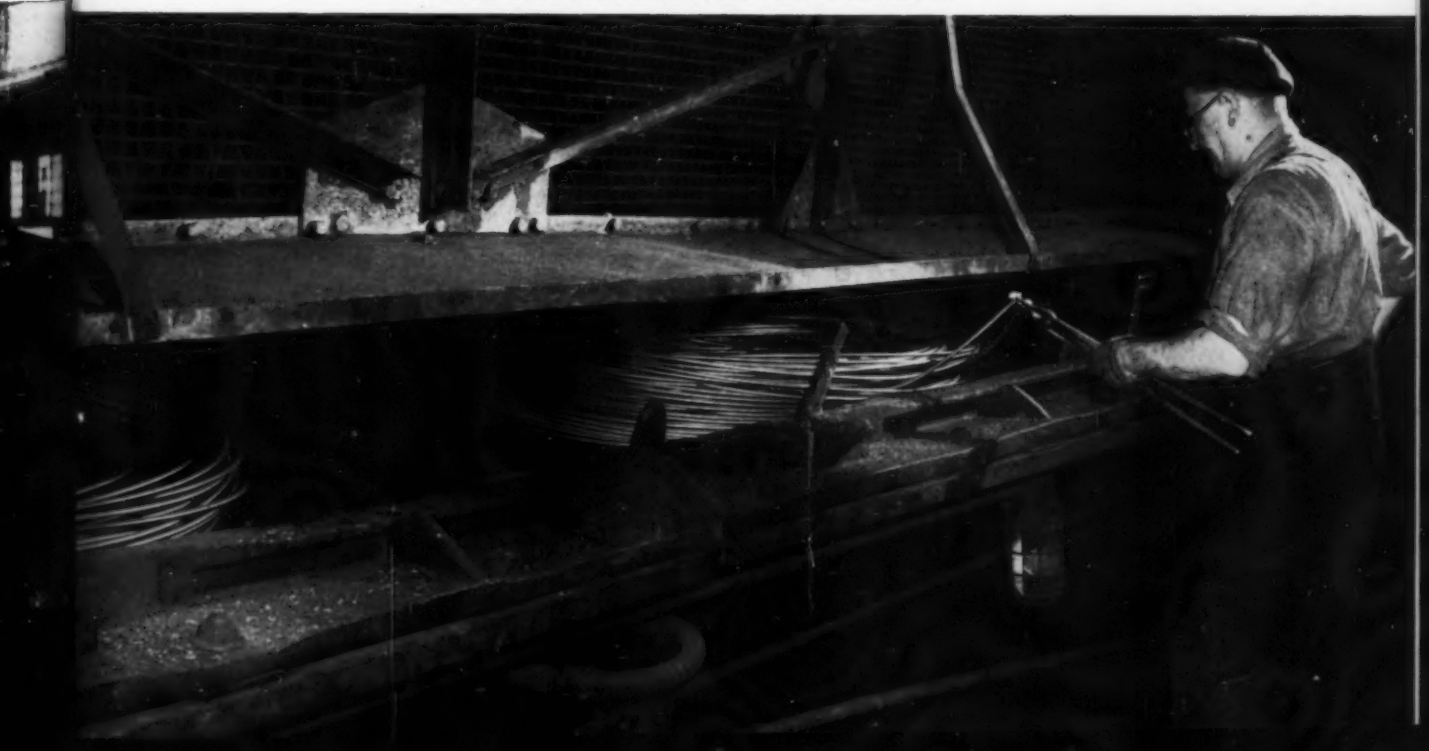
The population and steel-producing capacities of Canada's neighbours are factors which cannot be ignored in appraising the achievements and estimating the future of Canada's steel industry. The United States, with more than 156,000,000 population, has a steelmaking capacity reaching up towards 120,000,000 tons. Great Britain, with a population of 50,000,000 can make more than 16,000,000 tons a year. These figures are significant in terms of fabricated steel products, which represent the bulk of Canada's imports. Both the British and the American industry enjoy a preferred position in regard to the manufacture of items which are used occasionally but not constantly. There the sheer numbers of the buying public create a worthwhile market which does not exist in Canada's smaller population. Until the Canadian market expands, it is more reasonable and more economical to import such items. It is in the national interest to make and sell those things that

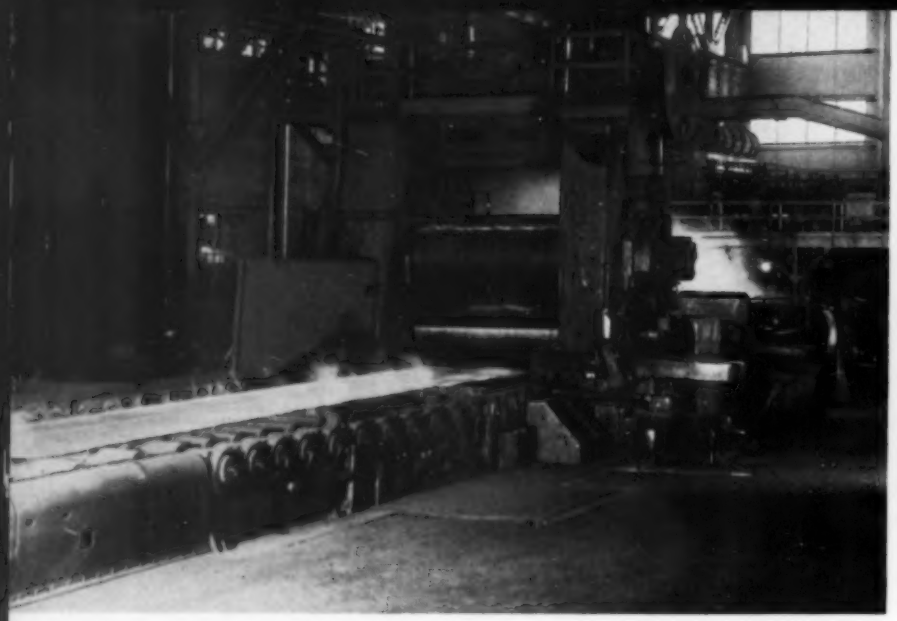
When steel is to be rolled flat, it comes from the blooming mill, in slabs like this. The slabs vary accordingly in size and thickness, depending on the end product.



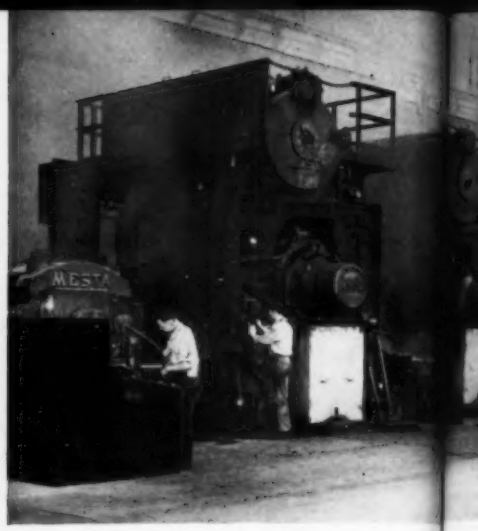
One of the most important steel products consists of wire in its many forms, and more than 150,000 items are made from it. These include anything from wire fence, nails, screws, bolts, and rivets to the tiny staples in a milk bottle cap or the stitching wire used to hold this magazine together. The first step in making wire is to roll the steel billet through a succession of roll stands to produce rod, as shown here.

Rod for making wire is always round, but it is manufactured in several different diameters in accordance with the size and type of the final product. Here a workman determines whether the rod has been rolled to the correct thickness.





Slabs can be rolled directly into plate and this 110-inch reversing mill at Stelco's Hamilton Works is the only wide plate mill in Canada. This mill rolled much of the plate that went into ships and armament produced in Canada during World War II. The mill also acts as a first rolling or breakdown pass for steel which is to become sheets, tin plate, or other thinner forms.



This 56-inch continuous hot strip mill takes it through a succession of six reductions the rolls in each stand turn faster than mill disgorges the red hot strip, up minute or about 21 miles per hour automobiles, electrical equipment, be coiled and passed on to the

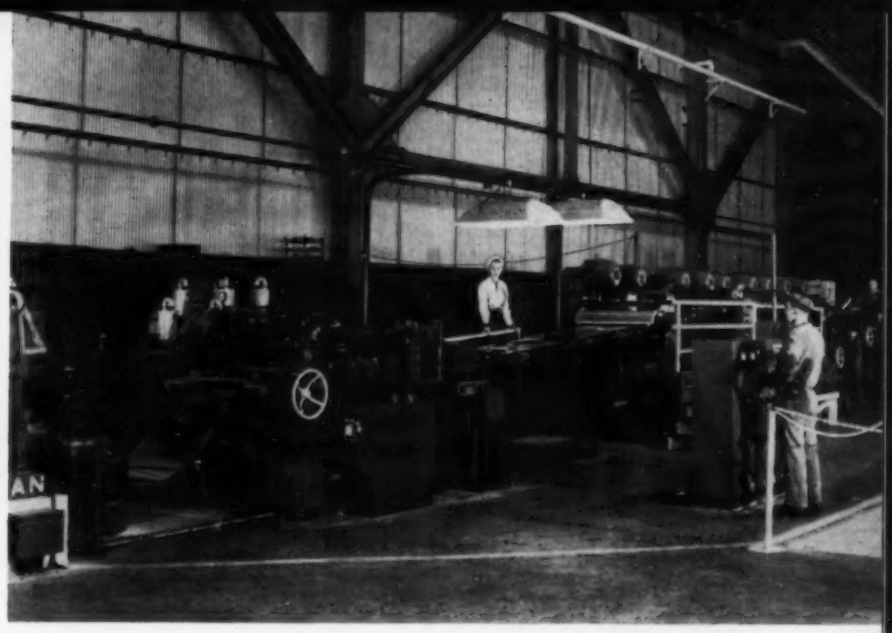
can most efficiently be made and buy those things other countries can make more efficiently. Our international trade, which represents nearly 30 per cent of our national income, is based on this principle. Nevertheless, our widening internal market and the installation of new equipment is resulting in a steady decrease in the need for steel imports in spite of unprecedented demands for this product.

Canada's position in the steel industry is one of rapidly mounting prestige. More than 100 per cent increase in the last decade is responsible in part. Significant also is the potential wealth of iron ore proved in Canada in recent years. Last year Canada produced 4,750,000 tons of ore, an amount roughly equal to the consumption of the nation's mills. Of this putput, the bulk, or 3,225,000 tons, was exported. The remainder was smelted mainly at Sydney, Nova Scotia, and at Sault Ste. Marie, Ontario. To

Quality control is a major responsibility of the metallurgical department, and here a metallurgist carefully examines a sample of steel.

Careful tests are made throughout all the processes in the steel mill. These tests start with raw materials, and this picture shows part of the raw materials and by-products testing laboratory of The Steel Company of Canada Limited.

strip mill takes steel from the plate mill and puts reduction on the steel becomes thinner and longer faster than those in the preceding stand, until the strip, up to inches wide, at nearly 1800 feet per per hour. Hot strip steel may be cut into sheets for ment, appliances and many other uses, or it may the cold reduction mill.



One of the newest additions to steelmaking facilities in Canada is the electrolytic tinning line. This takes the coils of cold rolled steel, welds the coil ends so that operation can be continuous, then runs the steel between electrodes. A thin even coating of pure tin is deposited on the metal, as it travels at a rate of up to 800 feet a minute. This picture shows the delivery end of the electrolytic tinning line.

the Wabana ore from Newfoundland, and the New Helen ore from Michipicotin in Ontario, has been added production from the Steep Rock mines near the head of Lake Superior. Together these mines last year exported to the United States and Western Europe almost as much ore as Canada imported. The vast deposits of Ungava, now only two years away from production, are certain to have a profound effect on the world of iron and steel. It is estimated that Canadian production of iron ore may reach 15,000,000 tons within five years. Such a figure would reverse Canada's historic position, making her an aggregate exporter rather than an importer of ore. If the supply from the Mesabi Range in Minnesota, the source of most ore for the United States industry, should ever become exhausted, Canada's proved resources are certain to make her a foremost figure in the world of steel and iron.

Some of the finest hospital and first aid facilities in any industry are to be found at the steel mills. The number of accidents involving loss of time as compared to the number of man-hours worked compares well with all other types of industry.

Steel companies have been in the forefront in developing safe practices and providing good working conditions. The modern industrial worker can wear his street clothes to the plant, hang them in a private ventilated locker while he works, and return home well dressed.

At Tangier a strange assortment of profiteers, smugglers, black marketeers, aristocrats, and displac… business transactions, and no income tax. Tangier's architecture is amorphous, pseudo, its state is artificia… it is the most expensive pla…

Tangier

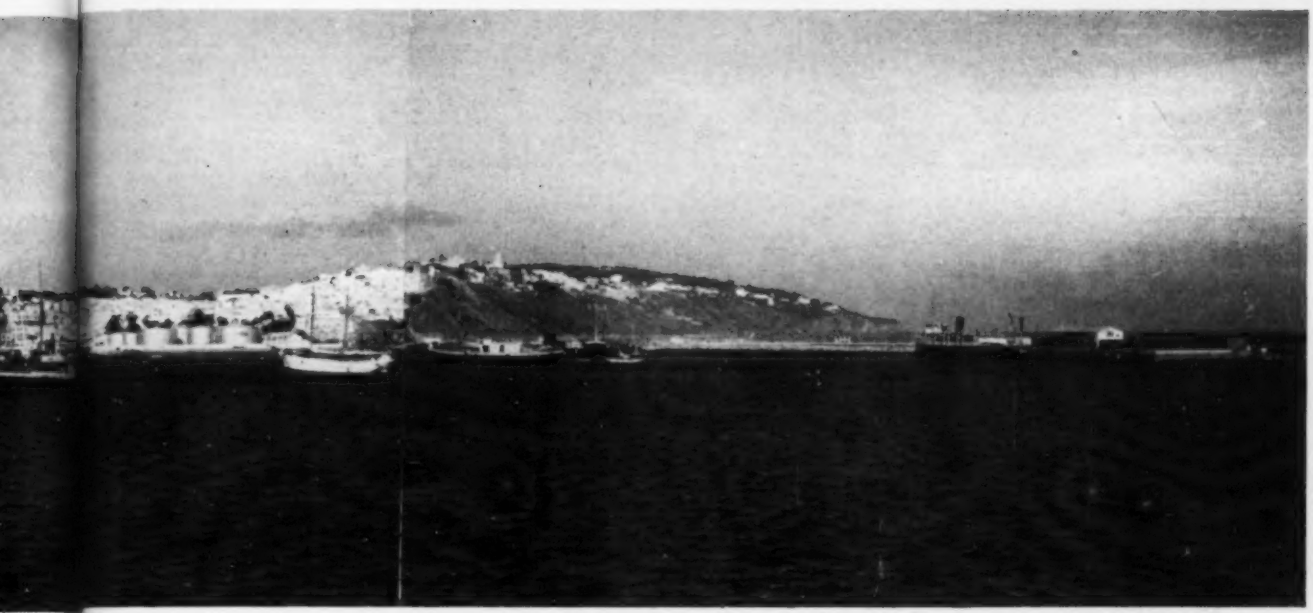
by ADRIAN BRUNEL

Photographs by Christopher and Adrian Brunel.

IT WAS a warm December night when I first came to Tangier. I don't know what I expected, but I felt that all was not as it should be when I was seized by excited Arab porters, dragged, coaxed and pushed down the precarious ladder at the side of our little ship and made to jump into a heaving, rocking rowboat that I could hardly see in the dark. Festooned with cameras and field glasses, I plunged, alighted with one leg in the Atlantic and was quickly smothered by a score of other bewildered and protesting passengers.

When it seemed that we would surely

Arabs come alongside to sell handicraft leather goods to passengers on ships in the harbour.



landowners from Europe gather. Most have come to Tangier because there is wide scope for unorthodox but it is a pleasant spot, with its white sands, avenues of palms, orange groves, and flowers, if the fact that an earth is of no consequence.

C. P M. Robertson-Fortay

sink, we were rowed in passionate jerks to the jetty, and after clambering up some seaweedy steps, were bundled into the Customs House, where forbidding French officials made an exhaustive search of our belongings and seized everything to which they could conceivably lay claim. Too tired to care, I left everything, climbed to my hotel and went to bed, thoroughly disillusioned.

Next day I saw Tangier and I couldn't believe it. For a small town it surprisingly managed to be everything and to have everything. The European quarter was rather like a little Spanish town and in it there was a considerable Spanish colony; the Moorish quarter consisted of the usual narrow streets of shabby, sullen-faced dwellings, and an occasional open square, the approach to some dilapidated palace or official building.

The main streets were thronged with donkeys, mules, camels, bicycles and all kinds of people; lean men from the Riff country, with their wide sombreros of straw, trudging to the market with their vegetables and their womenfolk, as heavily laden as their four-legged beasts of burden; European officials and traders conferring at street corners; white robed Moorish women, with faces covered, scurrying on their errands; shepherds and goatherds beating their straying flocks; priests and rabbis greeting their brethren as they went about their business; sparkling-eyed Spanish girls buying mantillas, ribbons, combs and cheap scents from the miniature stores in the local Bond Street; Spanish matrons in their black dresses bargaining with food vendors;

View of Tangier harbour from the city.

This "donkey garage" is as important in the Moorish quarter as is the modern automobile garage in the European quarter.

monks and nuns quietly hurrying about their mysterious tasks; women and children filling buckets, jugs and kettles at mosaic-adorned wells; Moors of every type buying lottery tickets, wheeling barrows or barrels, carrying planks or sacks; loungers at their cafés; money-changers at street corners, jingling their coins listlessly, but alert enough when business came their way. From the top of the hill rose the uproar of the Big Souk, or market place.

Narrow tortuous streets and overhanging buildings are characteristic of the native quarter.

The Souk is the most Oriental sight in this international town. Everywhere you look you find something to hold your fascinated gaze, whether it be the blind Arabian Nights beggar squatting on the ground, swaying to and fro, calling "alms for the love of Allah", or the merry young Jew in his tight fitting robe and black scull cap peddling a pathetic assortment of fourth-hand clothes. A fierce looking Arab with obvious "black" blood stands by a tray that contains his sad stock — old locks and keys, broken spanners, tops of hammers, broken door handles, and the like. Next to him stands a well stocked vegetable stall with a gay striped canopy, run efficiently by a ten-year-old boy. A doctor and a lawyer share a small tent topped by a red flag. A storyteller sits cross-legged on the ground, surrounded by an audience you might mistake for the Forty Thieves. Acrobats, poulterers, snake-charmers, bakers, conjurors, letter-writers, sword-swallowers, squat among the crush of passers-by. The confused sounds of strange but attractive Moorish music, the beating of drums, much laughter and some quarreling, the incessant jingle of bells, the thud of the feet of camels, mules and donkeys, and the impatient hooting of an occasional

In front of the Cafe Espana, itself an imitation of the sidewalk cafés of Europe, eastern and western costumes mingle.

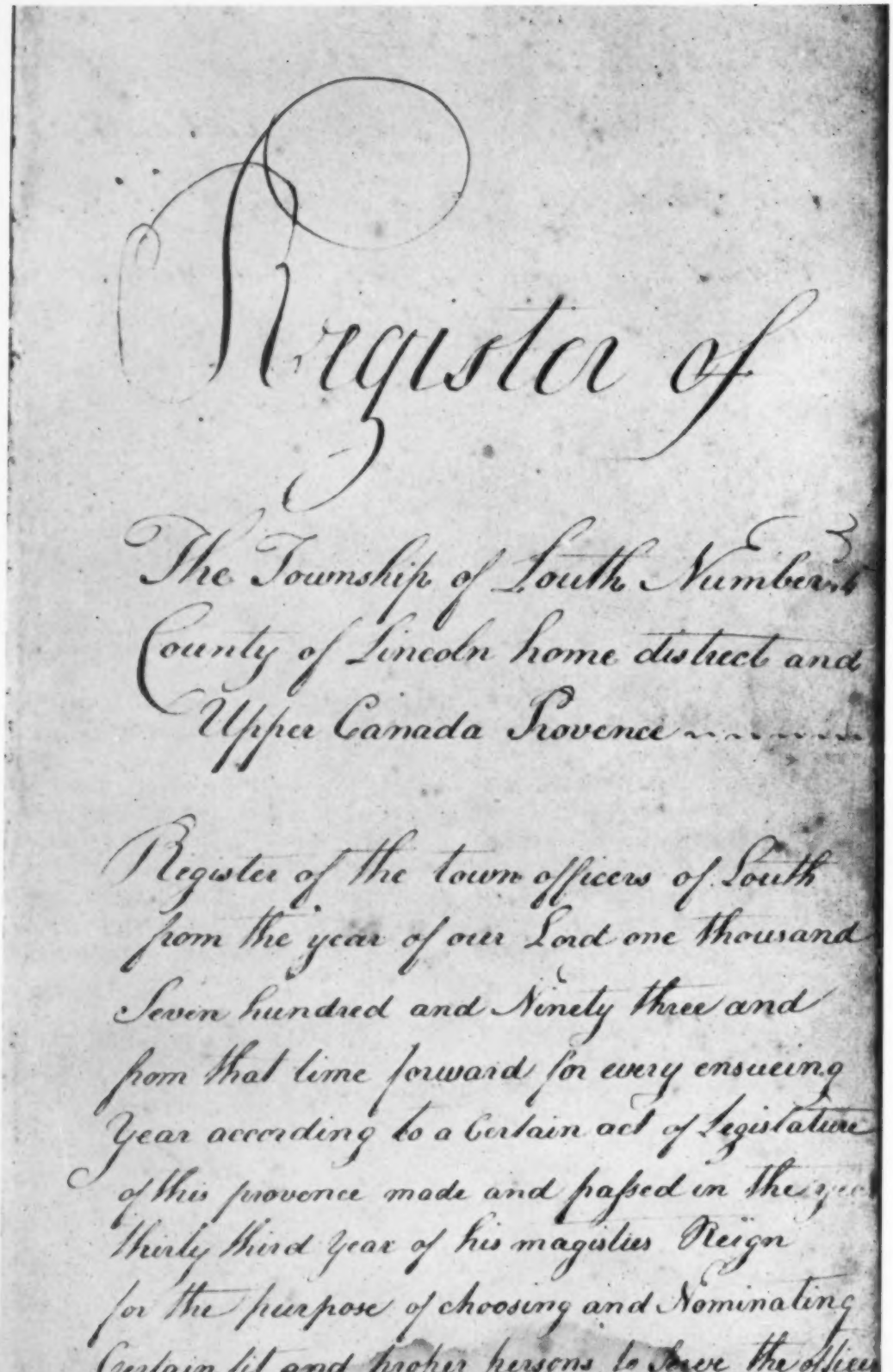
motorist's klaxon rise from the Souk, tempered by the tolling of a church bell, or the Muezzin's call to prayer.

Although the Europeans jostle and joke with the Moors and the Jews, they keep to themselves in their private lives; the masses are mostly humble workers, respectable citizens who avoid adventure and concern themselves with their families and the problems of the cost of living; while the others, the multitude of post-war arrivals, are mainly adventurers, whose joyful anthem seems to be, "I'm a schemer, aren't we all ?"

Since Tangier is an international zone, political schemers are well represented. I estimate that there is one member of the diplomatic and consular services to every 400 inhabitants. There are other schemers by the hundred, eager to build (if they could find the money) a new hotel, a country club, a swimming pool, a super cinema, a super garage, or a super casino although there are already several so-called casinos and over a score of places, mostly tough and low, where one can play roulette and baccarat with more than the usual certainty of losing.

Such was Tangier when I first went there thirty years ago, such it was when I returned fifteen years later and such it is today. Nearly 300 years ago it was British; since early in this century it has been an international zone and during the last war it was seized by General Franco; but its character does not change. Bigger and better hotels are built, the amenities for Europeans are improved and the town is extending, but the inner core of old Tangier is untouched and the whole remains the most intriguing example of East meeting West.

The fountain, social centre for the drawers of water, is by tradition a place of sanctuary.



Register of

The Township of South Number 3
County of Lincoln Home district and
Upper Canada Province

Register of the town officers of South
from the year of our Lord one thousand
Seven hundred and Ninety three and
from that time forward for every ensueing
Year according to a Certain act of Legislature
of this province made and passed in the
thirty third Year of his magisties Reign
for the purpose of choosing and Nominating
Certain fit and proper persons to Serve the offices

Path Masters and Pound Keepers

by RUTH M. HOME

THE REGISTER of a township council bears the same relationship to a novel as does a documentary film to an extravaganza. A register contains nothing but facts. It consists of a list of names, the jobs the owners undertook as members of the community, and occasional references to decisions of the council. Nevertheless, it can be exciting and fruitful reading.

The one that aroused my interest was the register of Louth Township, County of Lincoln in the Niagara district of Upper Canada, dating from 1793 to 1842. I found it stored in the attic of the township's warehouse, with other old records, all of which have now been moved for safe-keeping and exhibition to a beautiful case in the entrance hall of the Jordan Wine Company Limited. It is a long narrow book with the regulation dried tobacco coloured cover, a good rag paper within, mildewed and stained with damp, the writing in some places indecipherable, and the whole book has that musty smell, typical of age.

It begins in 1793 because in that year the act for the appointment of town officers for Upper Canada was passed. This initiated the system of local self-government that remained in operation, with revisions, until 1849. The first illustration is the frontispiece of the register, summarizing the act and establishing the authority by which the members of the council took office. The register marks, therefore, one of the first steps in the country's constitution.

The names in the register show the divergent nationality typical of the New England colonies and the strongly sectarian flavour, equally characteristic. Smith, Pawling, Beamer, Gregory and Jones suggest British origin as do their Christian names indicate a churchly upbringing—Solomon, Israel, Ebenezer, Abner, Ichabod. They are kin to the Christian, Charity and Prudence of *Pilgrim's Progress*. Peter Bradt, William Overholdt, Pieter Flumerfeldt, Vollentine Schram are as obviously of Dutch or German, perhaps Hessian origin, but there are many that I cannot attribute to any particular area, such as Mordica Sales and Benory Crum.

Their tasks were defined by the act, according to which there were to be appointed a clerk, two assessors, one tax collector, two wardens, one pound keeper and from two to six road or path masters, who were also to act as fence viewers. We are familiar with the duties of a clerk, assessor and tax collector. The term "warden" has an ecclesiastical connotation as it had in 1793, but such council positions as pound keepers, path masters, and fence viewers have either disappeared or have been absorbed by paid employees of the county or township.

The road masters looked after the highways. I think path master is the better term because it is an accurate description of the nature of the early rights of way. At first there were only three masters without any designation of duties, but by the time the register closes there were as many as twenty-four, each with a section of a road to keep in repair. Each man had his share explicitly and picturesquely defined. Undoubtedly numbered roads are more intelligible and practical, but I should like to know when I am driving over the road that ran from Josh Beebe's east corner to Barnabas

Left:—The first page of the register of the Township Council of Louth dating from 1793 to 1842. The summary of the act continues overleaf ". . . herein Mentioned the Ensuing Year and every year hereafter, (that is to say) one town clerk, two assessors, one collector, two or more overseers of highways or roads, one pound keeper, two town wardens".

Gregory's west line, that its smooth or chattering surface is due to the kindly ministrations of Adin Beebe and his professional descendant. And I would rather think of the Mountain Stage Road than Highway Number 8, as it now is.

From 1797 on, there is constant reiteration that "hogs are to run at large over six months old; horned cattle to run at large, horses not to run at large at any consideration. Bulls are not free commons. Fences are to be five-and-a-half feet high, well fitted with rails, to be staked and locked with good rails at every corner". Such legislation gave jobs to both pound keeper and fence viewers. Today the fence viewer only appears when a building is under construction or a ball game is in progress, but from the quotation it is obvious that he had then an important and necessary job. As it was the duty of the citizen to protect his crops from wandering animals, so it was the duty of the fence viewer to see that he did so in order to avoid dispute over property damage.

The pound keepers had to collect the horses, bulls and all the others which had jumped or broken through the fences, supply them with feed at the rate of one shilling and sixpence daily and, finally, notify the owners. This he could do because every animal-owning citizen had a mark registered in the township registry. In 1793, the marking was relatively simple, but by 1850, when the number of those registered was over one hundred, the marks were complicated. For instance, the one given to Levi Parker was "(right ear) swallow fork and two nicks, (left ear) full croop".

According to the law of 1793, the local constable must administer the oath of office. The form is written at the back of the book, but the swearing was not especially noted until the war of 1812; then, about the time that Laura Secord was walking her cow, each member was sworn in and the fact written beside his name (as shown in the second illustration). Similar oaths of allegiance are still demanded of public servants.

There is another item of interest that is also rather a mystery. In 1824, it was thought necessary to make a list of the slaves in the township. There were only three, Rose Green, purchased in 1804, and her two sons, Alexander and Charles, born in 1808 and 1823 respectively. She was the property of Joseph Smith, who was in turn assessor, collector, road master and church warden, a highly respectable member of the community, but who was the father of Rose's children ?

Pioneer conditions in the early years were much the same in any part of Ontario. All the settlers were confronted with the same problems, acres of uncleared land, poor roads and few bridges, scanty population and no public funds with which to make improvements. The register of Louth gives a picture in miniature of conditions that were general throughout the province. So circumscribed were the duties of councils by the act that each one could only be concerned with the same details of wandering animals, low fences and road repairs. The early registers can vary from one another only in the names they list; Adin Beebe, Peter Wycoof, Henry Beamer and the others would have their duplicates in other township records. These early councillors in every township should be remembered however, because, though their tasks were simple, they performed them so punctiliously, with such a jealous regard for individual rights and the sanctity of private property that councils today carry on according to the precedent established by these pioneers.

Right:—A page from the register for the year 1812 illustrating the insistence upon the oath of allegiance. Forbidden by their religion to make an oath, the Mennonites on the council certified only and so the word "sworn" is omitted after their names.

Photographs courtesy Jordan Wine Co. Ltd

Town offices nominated

March the second in the year of our Lord one thousand eight Hundred and twelve for the Township of South Colony of Simcoe District of Niagara and Province of Upper Canada

Names		Offices
Jacob Van Loon	sworn	Town Clerk and Inspr.
George A Ball	sworn	Inspr
Henry Fowling	sworn	Collector
Joseph Smith	sworn	
Robert Bunnetty	sworn	Path masters
Barnabas Gregory	sworn	
John Cornhott	sworn	
John Clark	sworn	
Isaac Wisner	sworn	
George William Reed	sworn	
Noah Jones	sworn	Path Masters
Israel Burtch	sworn	Town Inspr
Peter Plumberfelt	sworn	
James O'Conoly	sworn	Town Wardens
William Foster	sworn	

It is agreed at this meeting that fences to be four feet four inches high and not to exceed four inches Crevice for four feet high and it is further agreed that no hog be of more than two months old we not allowed to run

The tree is festooned with silk streamers formed by budworm larvae dropping from the branches.

The Spruce Budworm and Aerial Forest Spraying*

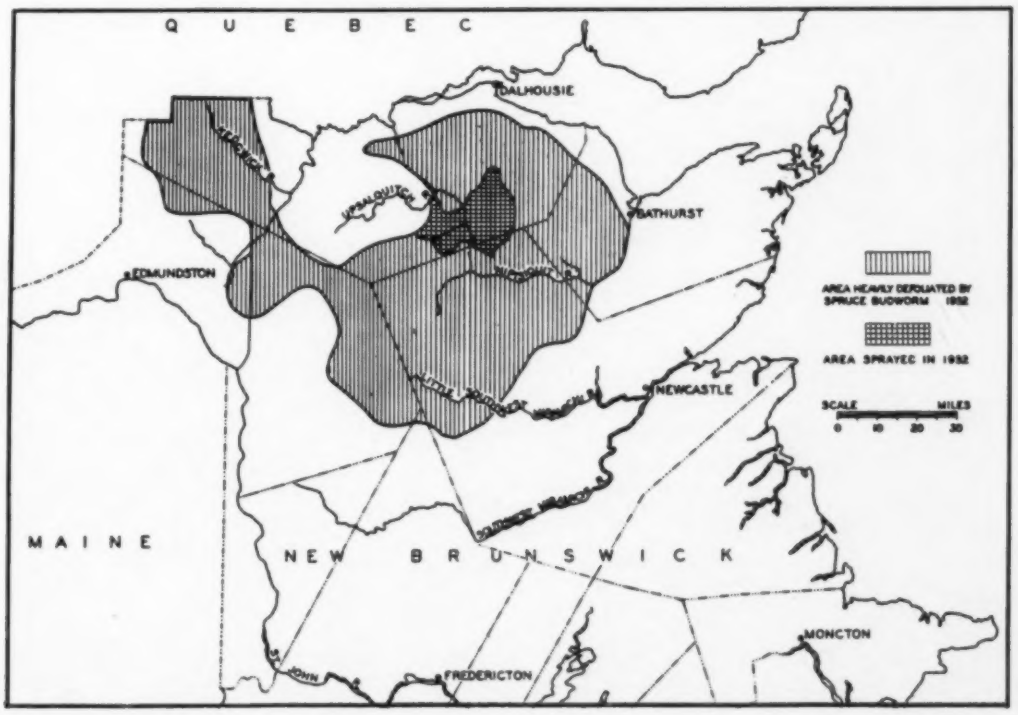
by R. E. BALCH

Photographs by D. C. Anderson, Division of Forest Biology, except where otherwise credited

THE SPRUCE BUDWORM is a small caterpillar but a big problem for Canadian foresters. Its favourite food is the young shoots of balsam fir and spruce. Periodically it becomes so numerous that it eats all the new foliage on these trees over thousands of square miles, particularly in Quebec, Ontario, and New Brunswick. Outbreaks often continue for five years or more until most of the trees are killed and those that survive are reduced in their growth. The stage is then set for another outbreak in the future as the succeeding stand invariably contains a high proportion of balsam fir, the tree most vulnerable to attack.

De Gryse[1] has estimated that some 250 million cords have been destroyed since 1909 — enough wood to make a band 4 feet high, 60 feet wide around the globe at the equator. In the past such losses have been offset by the fact that much of the timber was inaccessible and often over mature and its replacement by young stands was sometimes desirable. With the spectacular rise of the pulp and paper industry, however, and the need for more intensive management and full use of our spruce-balsam forests, their destruction has become a matter of great concern. It not only prevents the full development of forest industry, but can threaten the continued operation of mills which must depend on sustained yield from definite accessible forest areas.

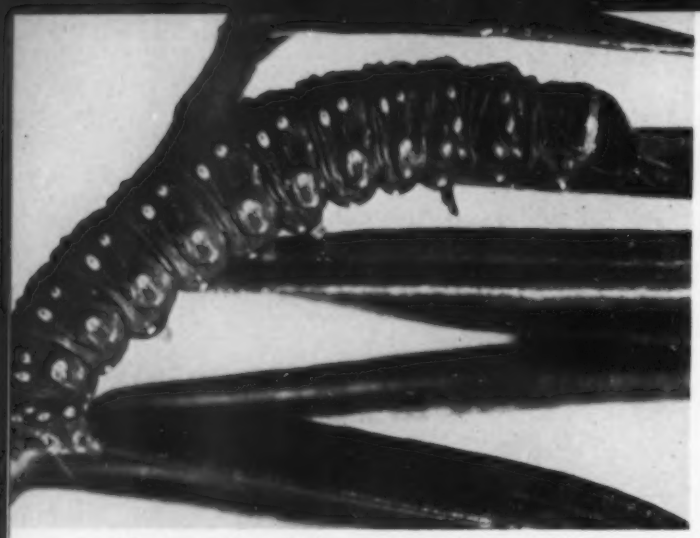
Although Canada's forests contain over 150 different species of trees, spruce and balsam fir make up almost half of the merchantable timber. In the East, they form the predominant forest type and are the



Showing the part of New Brunswick heavily infested in 1952 (vertical stripes) and the area sprayed (darker).

* Contribution No. 63, Division of Forest Biology, Science Service, Canada Department of Agriculture.

[1] De Gryse, J. J. Noxious forest insects and their control. Canada Year Book. 1947.



Mature spruce budworm larva. The actual size of the caterpillar is ¾ inch.

Pupa of budworm hanging from larval web.

Moth of the spruce budworm.

basis of the pulp and paper industry. Thus the management of spruce-balsam forests for sustained yield is imperative. Protection is an essential part of such management — protection from fire, insects, and disease, as well as improper cutting. The budworm not only increases the difficulties of protection from fire and disease but disrupts plans of management.

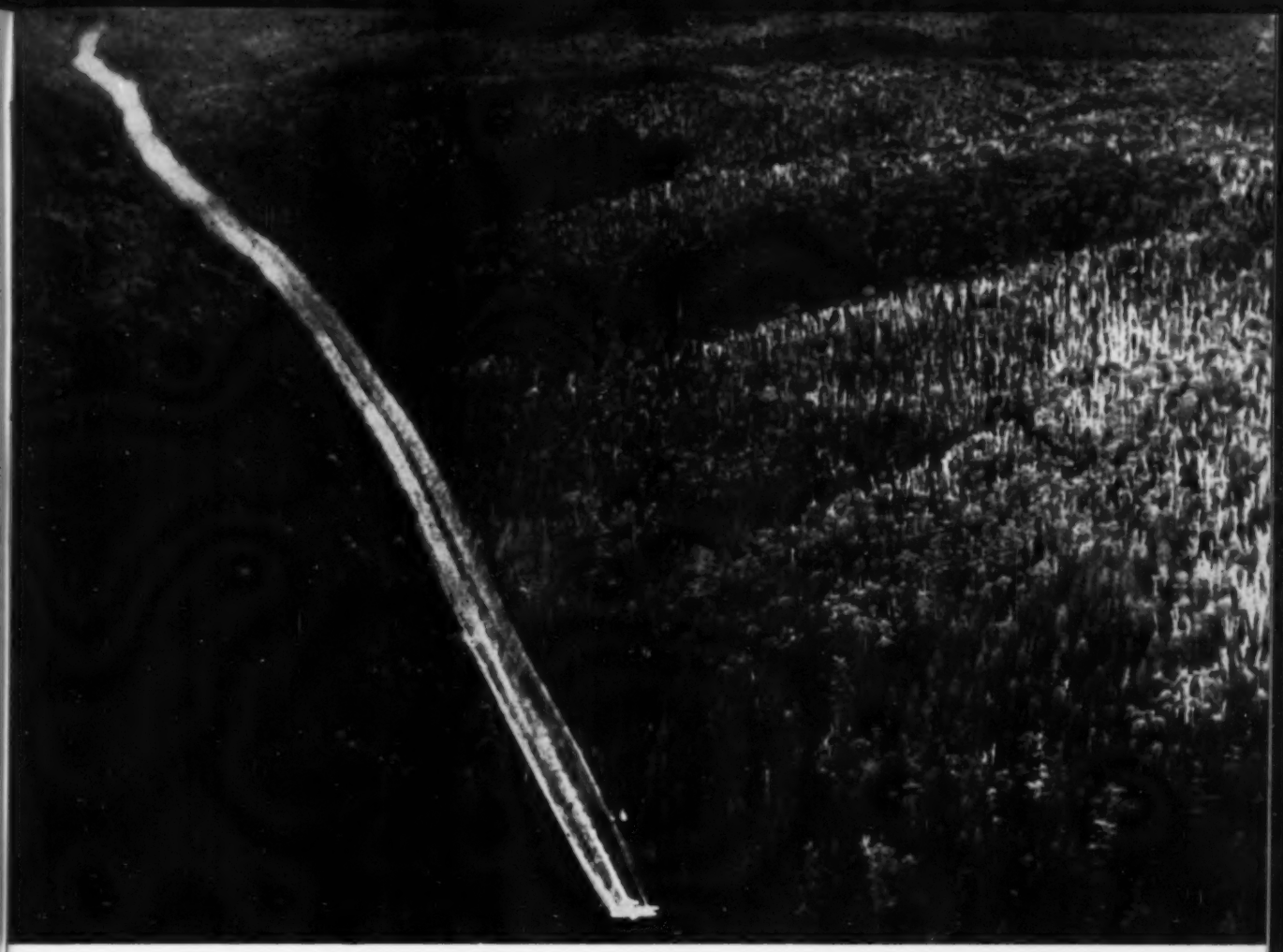
Research by the Division of Forest Biology, Science Service, Canada Department of Agriculture, in recent years has thrown light on the ecology and epidemiology of this insect, although further long-term studies will be needed before the complex of factors determining the time and extent of outbreaks is fully understood. It is known, however, that outbreaks have followed the occurrence of a set of climatic conditions which tend to recur periodically in different regions[2]. When the climate is favourable, the insect multiplies most rapidly in areas where mature balsam fir predominates — a fact that is related to the flowering habits of the tree. From these areas large flights of moths arise and, under the influence of wind, cause extensions of the outbreak. Although young stands may become heavily infested, and may be killed, the younger the stand the greater its chance of survival.

Thus one of the objects of management is to create forests that are more resistant to attack. At present this is largely a matter of reducing the areas of mature and over-mature stands with high balsam-fir content and bringing about a better distribution of age-classes. It will be most difficult where previous outbreaks have created large areas of balsam of one age. The problems of management are being studied in co-operation with the industry and the Forestry Branch of the Department of Resources and Development[3].

At the same time the possibilities of biological control are being closely investigated and a number of parasites and diseases

[2] Prebble, M. L., *et al.* Forest entomology in relation to silviculture in Canada. Forestry Chronicle 27(1): 6-37. 1951.

[3] The Green River Project for the Study of Forest Management in Relation to Spruce Budworm Control. Canadian Pulp & Paper Assoc. Woodlands Section Index No. 980 (F-3). May, 1948.



One of the Stearman planes leaving a trail of spray as it covers part of the forest infested by spruce budworm on the Southeast Upsalquitch in New Brunswick during the 1952 operations.
Bert Beaver, Canada Wide Photo

are being tested[2]. These methods of indirect or preventive control will take time to develop. Meanwhile more direct methods must be applied to current outbreaks.

The application of dusts and sprays to forests by means of aircraft has been the subject of investigation in the United States, Canada, and Europe at different times since 1921. It was not, however, until the discovery of DDT that the method showed promise of being effective against such insects as the budworm. Experimental work in the United States and Canada[4] showed that this insecticide was highly toxic to the budworm in the larval stages and it could be applied economically in a concentrated oil solution. This culminated in a number of commercial spraying operations, chiefly in Oregon between 1949 and 1951.

Reports of success in Oregon attracted particular attention in New Brunswick, where a new outbreak revived memories of devastation caused by the budworm some 30 years ago. Between 1914 and 1919, it infested the whole of the province, which is over 80 per cent forested, and it is estimated conservatively to have killed some 25 million cords. Evidence of the reduced growth caused by this attack can be found in the annual rings of almost any fir or spruce now standing that was over 30 years old at the time. In 1946 another outbreak seemed imminent in the northern half of the province. By 1949, this had materialized in the form of a heavy infestation centring on the headwaters of the Southeast Upsalquitch River. By 1951, this area had become badly defoliated and 2,200 square miles in the

[4] Forest Spraying and Some Effects of DDT. Div. of Res. Bull. No. 2. Dept. Lands & Forests, Ontario. 1949.

Airfield with take-off and landing strips, constructed for spraying spruce budworm infestation on the Southeast Upsalquitch in 1952. Loading stations lower right, and "Budworm City" at right centre.

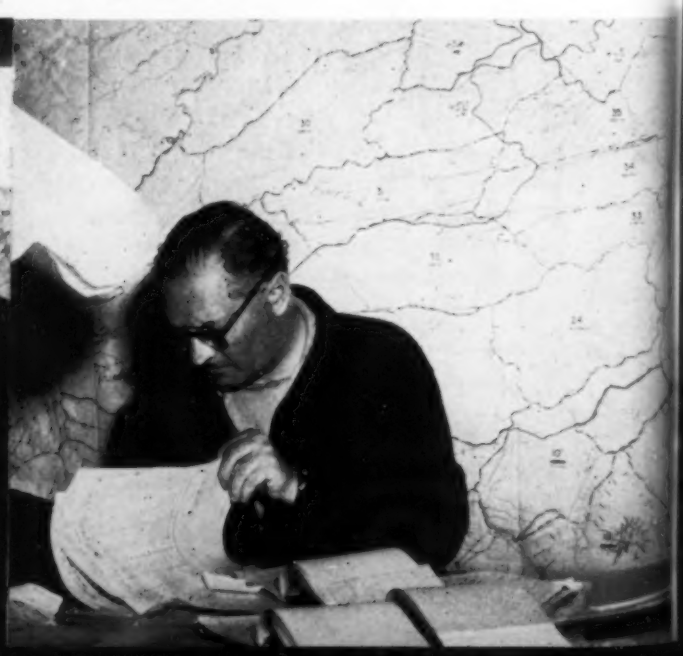
northern counties were being heavily attacked.

The New Brunswick International Paper Company had leased a large area of excellent pulpwood forest on the Upsalquitch and developed it for continuous operation on a basis of sustained yield to supply their mill at Dalhousie, N.B. Two foresters with the company, L. S. Webb and B. W. Flieger, had studied the results of the previous outbreak and were alive to the threat, as were also the foresters of the New Brunswick Department of Lands and Mines. The only hope of protecting this valuable forest lay in aerial spraying. On the initiative of the company it was decided that bold measures were called for and that, with the aid of recent experience gained in the United States, the possibilities of this method of control under the conditions obtaining in New Brunswick should be put to a large-scale test in 1952. The organization of the project was undertaken by the company and the planning and direction of the work was put in the hands of Mr. Flieger. The company and the province agreed to share the cost, and the Division of Forest Biology to give technical assistance and study the results.

The area chosen was approximately 300 square miles of the most severely defoliated forest on the Southeast Upsalquitch. This was larger and less accessible than any area previously sprayed and presented several problems for rapid solution. Much valuable information was obtained from United States foresters and entomologists. Some

K. R. Elliott and B. W. Flieger discuss the progress of spraying as shown on the map in the field laboratory at Budworm City.

Bert Beaver, Canada Wide Photo



W. H. Irvine checks spraying records in control tower. Map showing block division of area was produced by New Brunswick Division of Photogrammetry.

Planes at loading stations at the Upsalquitch air strip. Tanks at right contain insecticide.

new methods had to be devised, however, to meet Canadian conditions.

Owing to the hilly terrain, it was necessary to use small planes operating from an airfield within the area. The amount of flying time between loading and spraying had to be kept to a minimum. A suitable site on a small plateau was surveyed and during the winter a V-shaped airfield, with take-off and landing strips 2,500 feet long, was bulldozed out of the forest and surfaced. Three large tanks for insecticide and three smaller ones for gasolene were installed with pumping systems capable of delivering measured quantities to six loading stations. A control tower was erected. Near the airfield a camp was constructed for the accommodation of 200 men, including a laboratory for spray assessment and biological studies. This became known as "Budworm City".

As roads in this country are impassable during the spring thaw, all materials had to be taken in, over 65 miles of forest road, during the winter. This included 200,000 gallons of spray in drums, which would be subjected to temperatures of about 30° F. below zero. Formulations previously used employed fuel oil with an auxiliary solvent and freezing temperatures caused the DDT to precipitate and cake in the drum. The company obtained a solvent (Hi-Solv. 473) that laboratory tests indicated would withstand the lowest winter temperatures and be otherwise biologically and physically suitable. Subsequent results fully confirmed these tests. One pound of DDT was used to each U.S. gallon of the solvent.

Contracts were let for twenty Stearman planes and one Beaver plane to do the spraying. The Stearman, when fitted with a

A Stearman plane, showing the spray boom fitted beneath the lower wing.

Cotton mat used to measure drop of larvae from trees. Tree is later climbed and delimbed to calculate percentage survival.

450 h.p. engine, had proved very suitable for this kind of work and both types had the necessary carrying power and manoeuvrability. They were fitted with a tank from which the spray was delivered under constant pressure to nozzles along a boom beneath the wings. On arrival each plane was calibrated by trial runs to measure the width of swath, droplet size, and amount of spray delivered per acre. Adjustments were made to give an effective swath of 100 feet in calm air at 150 feet above the trees and to deliver 1 gallon per acre, with an average droplet size of 150 to 300 microns.

The area was divided into 43 blocks of approximately equal size and bounded by streams or other topographical features. These were allotted to individual pilots who flew over them with the chief pilot before spraying commenced to familiarize themselves with the terrain and determine the best method of attack.

The amount of spray reaching the ground was measured by means of a special paper impregnated with an oil soluble dye that was developed by Mr. K. R. Elliott of the Division of Forest Biology, with the co-operation of forest entomologists at the Agricultural Research Center, Beltsville, Md. The droplets of spray left circular marks on the paper proportionate to their size and this permitted estimation of the amount deposited per acre. Samples were placed 100 feet apart along lines three-quarters of a mile apart across the general line of flight in each spray block. These were put out and collected by a crew of forty men employed by the company, and were classified by comparison with standard sheets of known deposit per acre. Missed areas were resprayed.

Spraying was done when the wind velocity was less than 8 miles per hour above the trees, when there was no upward air movement, and no rain on the trees. These conditions prevailed generally only for two to four hours after dawn except on occasional calm, cloudy days. Weather stations were

Lloyd Coady and F. E. Webb analyzing budworm samples at the field laboratory.
Bert Beaver, Canada Wide Photo

Dyed paper used to assess spray deposit, showing marks left by droplets of spray, and standard samples used for classifying in left hand.

set up at three fire lookout towers and wind speed and direction, temperature, and visibility were reported by radio every quarter-hour to the control tower.

It was necessary to do the spraying within a period of two weeks, after the insect had reached the fourth larval stage; in other words, after it had begun to emerge from the expanding shoots sufficiently to be exposed and before it began to pupate. As the insect eats three times as much in the sixth, or final, larval stage as it does in all previous stages, the sooner the spraying is done the less will be the defoliation.

Development of the insect was measured by daily samples taken throughout the area and spraying was commenced June 14th, when 78 per cent of the larvae had reached the fourth stage. This was two days later than the previously calculated date for a normal year. Unusually wet and stormy weather held up progress of the work but it was completed just as pupation commenced. The figures below showing dates of spraying and gallons used indicate the limiting effects of weather and the importance of an adequate number of planes and efficient organization if full advantage is to be taken of the limited hours of suitable weather.

The traffic control and system of loading were such that no time was lost between flights. The average time between landing and take-off was four minutes. The Stearmans carried 125 gallons of insecticide, which was sprayed at a rate of 20 gallons per minute, and they averaged a little over two and a half trips per hour. The Beaver carried 200 gallons.

Mr. Elliott's report on spray assessment showed that, of a total 189,503 acres in the treated area, 185,783 acres were successfully sprayed, and 11,220 acres were called for respray. The fact that only 2 per cent of the area was missed is attributable to the skill of the pilots, who had previous experience in this type of flying, to good organization and checking, and to the drifting of the spray, which resulted in a wide effective swath and compensated for inaccuracies in flying.

Studies of the effects on the insect were carried out by two crews of students and rangers under the direction of F. E. Webb of the Fredericton Laboratory of Forest Biology. One crew worked on the sprayed area, the other on a comparable unsprayed area about two miles distant. The budworm population was sampled daily on both areas, commencing when the young larvae emerged

Date	Daily total U.S. gallons	Per cent spraying completed	Date	Daily total U.S. gallons	Per cent spraying completed
June 14	19,311	10	June 25	49,367	78
17	35,131	28	27	38,027	98
21	5,390	32	28	2,437	99
22	12,650	37	29	1,757	100
23	29,801	53			

A stand of balsam fir that has been killed by spruce budworm, in Ontario.

from the hibernating webs in May and continuing until the eggs of the next generation were laid in August. The method used was removal of 18 inches of branch from the mid-crown of numbered trees with a 30-foot pole fitted with pruning shears and a canvas basket, on plots distributed throughout the area. The sample branches with their insect inhabitants were placed in numbered paper bags and taken to the field laboratory in packsacks. Here the numbers of each stage were counted and the amount of defoliation recorded. Parasites and predators were also studied.

This work is still in progress and will be continued throughout the outbreak period to determine the long-term effects. The immediate results, however, are now known. Most of the larvae dropped from the trees a few hours after spraying and within a week practically no living larvae remained. Comparison with the unsprayed area indicated that, after allowing for mortality due to natural causes, the control due to spraying ranged between 99 and 100 per cent on the different plots.

Those parts of the area that were sprayed early showed considerable growth of new foliage, those sprayed later had most of the new foliage destroyed but were protected from feeding on the old foliage. In the unsprayed areas the new foliage was completely destroyed, a considerable amount of the old foliage was eaten, and the population remained high.

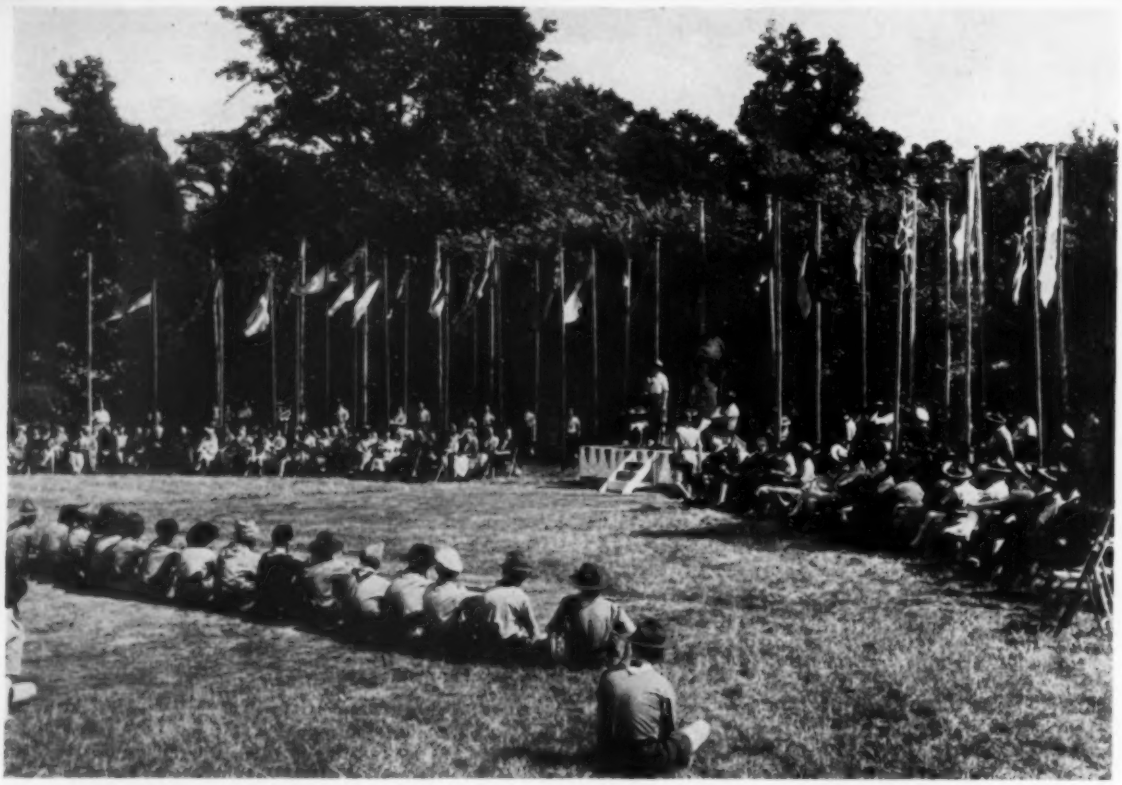
The elimination of the budworm from 300 square miles does not, of course, ensure continued freedom from reinfestation. In 1952 over 5,000 square miles were mapped as heavily infested in northern New Brunswick alone and trap lights and observations at fire towers showed that great flights of moths took place. Egg counts are being made to measure the degree of reinfestation.

The trees have been given a valuable degree of protection but the long-term results will not be known for several years. The objective was not to halt the outbreak but to prevent the trees from being killed by protecting them from complete defoliation until the outbreak subsides. The possibilities of spraying can only be determined by large-scale trials. The Upsalquitch project has shown that many of the difficulties of aerial forest spraying have been solved. It will provide valuable data on which to base future decisions regarding its use. The conditions under which it was carried out provided a particularly severe test owing to the susceptible nature of the forest and the size and aggressiveness of the outbreak in the region.

It was recognized that the wholesale use of a potent insecticide might have undesirable effects on forest fauna and the so-called balance of nature. Some beneficial insects are killed. Birds and fish might suffer from destruction of insect food or be directly affected by the poison. Previous studies have indicated that the danger of this from one pound of DDT per acre is not serious. Further studies were made of this aspect by experts of the Department of Fisheries and the Department of Resources and Development. No evidence of any important deleterious effects on fish or wildlife has been received. As far as the 'balance of nature' is concerned, it must be remembered that in this case it has already been disturbed by the budworm, which itself is not adequately controlled by natural factors. If it destroys the forest, it produces profound changes and violent adjustments in the floral and faunal populations — as well as in the industrial economy of the region. The problem is to prevent this final disturbance. One very welcome effect of the spraying was to eliminate the mosquito and black fly nuisance from the area for several weeks.

In conclusion it may be said that the success of the actual spraying operation must be attributed to excellent organization by Mr. Flieger and to the spirit of co-operation among those who contributed to its planning and execution. Many workers in different fields were brought together by a common interest in this largely pioneer operation. It has provided the solutions for a number of problems involved in the application of insecticide to large forest areas under New Brunswick conditions, and marks a new phase in the use of aerial spraying in this province.

Two branches of balsam fir. That on the left was unsprayed and shows destruction of new shoots; that on the right was sprayed early enough to save many of the new shoots.



Lord Rowallan, the Chief Scout, officially opens the Indaba while leaders of contingents from fifty nations sit before him on the grass. Behind the dais is a picture of Lord Baden-Powell of Gilwell, founder of the Boy Scout movement. On either side are diplomatic representatives of the countries attending.

Indaba

by HUGH P. BELLANTI

Photographs by Lawson F. Gregory
by courtesy of the U.K. Information office

MEN AND WOMEN from fifty countries took part in the first world "Indaba" for scout leaders held in July 1952 at Gilwell Park in southeast England. The main purpose of the Indaba (a Zulu word meaning "meeting of tribal chiefs and counsellors for discussion") was to provide a camp for men and women scout leaders over the age of eighteen for the informal exchange of ideas and information and the promotion of international friendship. Canada was represented by ten scouters, who came from the provinces of Nova Scotia, Quebec, Ontario, Alberta and British Columbia. They were led by the Ven. Archdeacon B. A. Resker, District Commissioner for the Trail-Rossland District of B.C., and among their number was John L. MacGregor, Assistant Exec-

One member of the Indian contingent was this woman scouter from Bombay.

A section of the large crowd of scouters from nearly all over the world at the opening of the Indaba. In the foreground are the contingent leaders. The two bearded scouters standing up are from India and Hong Kong respectively.

utive Commissioner for Training at Canadian Scout Headquarters.

The Chief Scout of the British Commonwealth, the Lord Rowallan, opened the meeting in the presence of the diplomatic representatives of the countries interested. He shook hands with the leader of each contingent and later visited each national camp-site and chatted with the visitors. As Lord Rowallan said during his address of welcome: "The value of this camp will be found in the quiet talks you have with one another." There were plenty of these gatherings.

During their eight-day stay in camp these men and women from so many parts of the world entertained one another to meals, joined in song and dance, attended religious services according to their creed, took part in national as well as international displays and, above all, met one another, talked, argued and made friends, living together on British soil as one varied, colourful but strongly united family. What hope they inspire for the future of human relations!

The discussion groups went over many problems, some of which were peculiar to certain countries, but many of which were common to all. As one scouter wrote about the Indaba, "the true feeling of the brotherhood of scouting was present there".

The camp in Gilwell Park was opened to

On a tour of the national camp-sites, Lord Rowallan greets a visitor from Finland who had forgone attendance at the Olympic Games to come to the Indaba.

The tea habit prevails in many nations and here some of the visitors from Nigeria refresh themselves at their camp.

In the Malay camp guests and hosts join in a Malayan dance called the "Ronggeng". Here, taking an active part, are scouters from (left to right) Britain, Singapore, Egypt, Malaya, and the Sudan.

British scouts were keenly interested in their visitors from overseas and many toured each camp-site collecting autographs. These London youngsters are getting the signature of a camper from Denmark.

On visitors' day, British boy scouts put on an entertaining display in the arena. One of the popular items was this wolf cub show given by the 37th Chingford District Cubs.

The Norwegian contingent is seen here entertaining Greeks, Italians, Finns, Australians, Swedes and West Africans. The hostess, standing by the flagpole, is wearing Norwegian national costume.

the public on two days and thousands of scouts and their families from all over Britain flocked to meet the visitors. On one of these days an entertaining display was given in the arena by British scouts from various parts of the country.

The visiting scouters also had a day in London. They went to factories and places of interest, and were invited to the Battersea Pleasure Gardens after representatives of each contingent had attended a government reception in their honour.

One of the camp fires at Gilwell was televised by the B.B.C. and broadcast to the nation. While scouters from Austria, Britain, Germany, Greece, India, Italy, the Netherlands, New Zealand, Nigeria, Norway, Pakistan and the Sudan took turns to entertain their colleagues with song and dance and mime, televiewers all over Britain watched the romantic scene on their screens at home and thrilled to the voices of several hundred men and women from fifty different countries singing together in harmony, in English.

The embers of the fire round which that camp gathered are dead in Gilwell Park. Not so the memories and new friendships born at the Indaba. These will continue to grow and to be cherished by each scouter who was present who, in turn, will share them with his or her compatriots.

Some of the Australian contingent busy preparing tea. These scouters hail from the states of South Australia, Victoria and New South Wales.

Camp gatherings among the nations were frequent and happy. At this party scouters from Greece (left), Italy (with guitar), Norway, Britain, and the Gold Coast join in an Italian song.

At all times nation mingled with nation and here Moslems from three countries have an absorbing discussion. From left to right they represent Egypt, Pakistan, and Aden (two).

As the camp fire logs in Gilwell Park die to embers, each national representative lights a torch and walks out of the semicircle in procession. Now the torches have faded, but the memories and friendships of the first World Indaba glow and spread.

EDITOR'S NOTE BOOK

B. J. McGuire is a partner in the public relations firm of Forster, McGuire & Company Limited of Montreal. Interested in business since he edited "The Varsity" in 1936, his experience in editorial and industrial relations work gives him a good insight into the industrial developments he has explored for the Journal. — Adrien Brunel is a British free-lance writer and playwright who has made a special study of Morocco, extending over thirty years. — The interests of Ruth M. Home are wide. This one-time librarian, with a master's degree in political science, specialist in ceramics, has been on the staff of the Royal Ontario Museum and lecturer in the department of fine arts at the University of Toronto. Miss Home's present field is research in historical and primitive backgrounds. — R. E. Balch has for more than twenty years been in charge of the Entomological Laboratory, Science Service, in the Department of Agriculture and is well known for his work on forest entomology. Before entering Canadian public service, Dr. Balch served on the staff of Ontario Agricultural College, with the U.S. Bureau of Entomology, and overseas with the Canadian Army in World War I.

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ERRATUM

Vol. XLV, No. 2, August 1952, p. 76: In the eighth line, 3,000,000 kw. should read 300,000 kw.

AMONGST THE NEW BOOKS

My Australia

by M. Barnard Eldershaw
(Ryerson, Toronto, $3.00)

This is a revised edition of a book which met with considerable success when it was first published in 1939 and, for those to whom Australia is not already familiar, it may prove a useful introduction. Possibly it suffers most from the effort to crowd everything into so brief a compass.

"There is a new world and an old world in Australia" we are told, and it seems to me that the author has made a better job of the old world than he has of the new, for his account of the countryside and the natural history of the continent is a good deal more readable than is the record of its political evolution from the beginning, a hundred and fifty years ago, till today. The early history of the settlement is quite well-handled but unfortunately brief.

The author quotes a good many other writers and it is difficult to escape the observation that these extracts are better written than the rest of the book. There is a good sketch of Australian art and literature, and a brief bibliography which will be useful to those who wish to pursue the subject further. The omission of an index is almost incomprehensible and quite unforgivable.

DOUGLAS LEECHMAN.

* * *

How I Draw Birds

by Roland Green
(Macmillan, Toronto, $3.25)

Roland Green is one of England's top bird artists and almost equally famous as a lecturer and demonstrator of drawing techniques. Here we have three or four hundred of his sketches in a variety of styles, using line drawing, wash, toned paper, and scraper board. The wash drawings are among the most delightful, pleasantly reminiscent of Chinese art.

There are studies of dozens of different species

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of birds, with detailed drawings of beaks and heads, legs and feet, young birds and old, juvenile plumage, birds flying, swimming, standing, and perching. There are useful instructions in different media, in field methods, and in the choice of drawing materials.

The author urges the beginner to make many sketches and always to persevere. He suggests studying a model, such as a mounted museum specimen, for five minutes and then making a drawing of it without looking at the subject again till it is finished. Above all things, work boldly and with decision, avoiding feeble, hesitant drawing. It's a valuable book for any ornithologist, professional or amateur, and surprisingly inexpensive. DOUGLAS LEECHMAN.

* * *

Turkish Crossroads

by Bernard Newman
(The Ryerson Press, Toronto, $5.00)

"I dumped my bag in a hotel at Istanbul, and walked to a tramway halt." This is the opening sentence of Mr. Bernard Newman's newest book, *Turkish Crossroads*. It epitomizes the author's outlook for the whole of his stay in Turkey — informal, talking to villagers and townsfolk, to Government officials and professional people alike, at the same time making penetrating observations of his own.

In his peregrinations, Mr. Newman was able to sample the life of the coast including Adana, Izmir, Ephesus and Istanbul, and many of the interior plateau and mountain regions of Turkey. His means of travel varied from Turkey's show train to country buses, from a lift in a British Council officer's car to a bicycle. It must not be supposed that this book is of the traveller's diary variety without any background material. Mr. Newman is not only a skilled observer with a very wide range of experience to draw upon but also a student of the several aspects of international affairs and, perhaps above all, a clear, simple writer able to provide the reader with a valuable insight into present-day Turkey.

Controlling the one 'water gap' in the mountainous rim containing the Soviet satellite countries, Turkey's international importance has rarely been greater than now. The author's aim seems to be to show to the reader the extent to which modern Turkey is facing up to this position as curator of the Straits. He has blended his own keen observations with those of fellow travellers and put them in their right perspective with chapters upon political development, facts and figures, historical background and geography. In a well balanced, intimate, yet objective, manner Mr. Newman leaves no doubt in the reader's mind that the Turkish people are busily engaged in putting their house in good order and have " . . . made up their minds and set their course". (*Continued on page XIV*)

(*Continued from page X*)

Much of the effectiveness of the book is the result of skilful use of both photographs and sketch maps. The maps are simple and would serve well as examples to other writers who all too often completely neglect this means of illustration. J. D. CHAPMAN

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Far Corner

A Personal View of the Pacific Northwest

by Stewart H. Holbrook

(Macmillan, Toronto, $4.75)

Beauty, we are told, is in the eye of the beholder, which would imply that, for those who cannot perceive beauty, it is non-existent. There really are such people. I have seen tourists continue their bridge game undisturbed while navigating the Five Finger Rapids on the Yukon, and I am still convinced that the last trump will come from one of them rather than from Gabriel. But it will not come from Stewart Holbrook for he is one of those who well perceive the beauty that surrounds us, and he fully appreciates the many forms that it may take.

He sees the Pacific Northwest as a whole, extending north and south along the coast and inland to the Rockies. He sees it stretching back into history and forward into the future. He sees its legends and its myths, its romantic episodes, and its delightful and often quite incredible inhabitants. His neat phrases and vivid similes show us both the country and the author's own colourful personality. For one who knows that part of the world and, indeed, for those who don't this book makes good reading.

With one point only must I take issue. Stewart Holbrook says that when he crossed the Rockies, sometime in the 1920's, and rode down the West Slope to Vancouver, he was wearing the only derby hat in British Columbia. Oh, no, indeed. I got there at least ten years before that, wearing a derby hat, and strange indeed I must have looked as I climbed off the "accommodation" train in the Nicola Valley in the middle of a March cold snap. Moreover, it wasn't my hat! Some culprit had taken mine and left me his derby, which didn't fit! DOUGLAS LEECHMAN

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Photography Afield

by Ormal I. Sprungman

(Stackpole, Harrisburg, Pa., $7.50)

This is a first-rate book for bringing the outdoor photographer up to date in his hobby and for introducing a newcomer to one of the most rewarding forms of hunting. There is little that is distinctly new, except in the way of gadgets and equipment and a few new processes; the basic fundamentals of good photography still hold firm, and the author discusses them competently and at length.

There are a great many illustrations. It is a pity that their satisfactory reproduction necessitated using a coated stock so heavy that the book can not be held comfortably in the hand for more than a few minutes. There are a number of colour plates too, but the reproduction of these leaves a good deal to be desired.

Occasionally the author, trying to make his material as light and readable as he can, never an easy task in technical matter, assumes more knowledge than his reader may possess and uses phrases familiar to the old-timer but perhaps not understood by the beginner. Nevertheless it's an excellent book, and well worth the very low price asked for it. DOUGLAS LEECHMAN